ITEMS OF INTEREST.

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Editorial.

DISCRIMINATION IN THE CHOICE OF FILLING MATERIALS.

Successful filling depends upon intelligent discrimination in the choice of filling material, as well as in skilful manipulation. Too many dentists have neglected investigation into this feature of their work, and are thoughtlessly in a rut, or too easily yield to the judgment, whims or cupidity of patients, against their own convictions.

Much light has been shed upon this subject by the discussions of those who radically differ, as well as by calmer investigations. But, while some have very properly contended for the excellencies of gold, and warned us against lowering the standard of our profession by doing inferior work, others have convinced us of the value of plastic fillings, and given us many wise suggestions in their use.

Though there is still abundant room for improvement in our filling materials, we think if some, who complain of their paucity, would investigate the merits of what we have, they would find them of greater value in variety and adaptability than they suppose.

Tin is one of our oldest fillings, and it makes a good, tight, durable, non-conducting filling. To produce a greater plasticity in manipulation, some prefer a thick foil—say No. 60—of lead plated with tin. Theoretically, lead is objectionable; we have never known it to be so practically, though our observation is not extensive. We did once remove a leaden bullet from a tooth cavity, which had been jammed in by the patient some years previously, for the want of any better material, and it had done good service without apparently producing any ill effects. But the labor of manipulating tin, or lead and tin, is almost equal to that of gold.

Amalgam, or alloy, as amalgam is called for the sake of distinction, when gold is added, or gold and platina, has of late years been greatly improved. It is true, some fillings under these names are mere impo-

sitions—unworthy, unreliable and injurious—but many are really good, and have special merits.

Some years ago, a dental agent by the name of Haverstick, said to us: "Welch, we ought to have a filling material more nearly resembling the bone of the tooth. Here, take this analysis of the dentine and study it over." We had been studying this subject over in a dreamy sort of a way; and others had been more diligent in this direction than we. We now entered into this study more thoroughly, but though we nor others found anything reliable which very nearly resembled the composition of a tooth, we did obtain what has proved a good filling for many purposes, and is known as phosphate of zinc, zinc phosphate and oxyphosphate. Much more credit, however, is due to others than ourself.

Gutta percha has earned a place as a filling, though its place may be considered somewhat subordinate.

In the manufacture of gold foil there has been many improvements of late, especially in the production of a variety combining velvety softness with peculiar cohesiveness. Those who have not seen this would do well to become acquainted with it.

To know what material to use in a given case is not always clear, and it is difficult to gain sufficient knowledge from written instructions. Patient, intelligent study of the whole subject, and the application of this to daily practice, is indispensable. Yet a few suggestions may aid.

1st. Of course, we must place gold at the head of our list. Its indestructibility by the action of the fluids of the mouth, or even by those agencies which destroy the tooth itself, its having no chemical action on the tooth into which it is placed, its resistance to abrasion from mastication, the nicety with which, by skilful manipulation, it can be made to fill a tooth-cavity and be adapted to its walls, and the general preference given to its appearance, where filling must show, makes it the most generally adapted to our use in ordinary cavities in teeth of ordinary character for patients of ordinary condition of nerves. But where there is hyper-sensitiveness of patient or teeth, especially if the patient is weak or young, for whom the manipulation of gold is too tedious, or where the teeth are tending to disintegration with the pulp nearly or quite exposed, dentine soft and enamel wells frail,—in these cases the use of gold is precluded, except for mere show as a covering for other materials.

Amalgam, and especially gold amalgam, or gold and platina alloy, undoubtedly comes next to gold. In fact, for fillings of extraordinary size, or in teeth specially frail, or where its presence is not a dissight, we believe alloy, if properly compounded, prepared and manipulated is nearly, if not quite, equal to gold foil. It has one quality that is superior – its perfect plasticity gives it greater solidity and more perfect

conformity to the shape of the cavity; and even where the cavity is in sight, it makes a good, acceptable and durable filling if the surface is plated with gold. It is peculiarly adapted to fillings for children's teeth. In these any filling will be found temporary, on account of the tooth structure. We may say the same of the first permanent molars, while the deciduous teeth are being shed. In these no filling material will quite prevent decay, for the active, forming acid present is sure to effect their immature structure.

By-the-by, plastic fillings are often charged with causing decay, or of not preventing it, when the character of the filling material has nothing to do with it. If frail, crumbly teeth are filled with gold the same result will follow. The teeth give way, not because of the character of the filling, but in spite of it. Many teeth which no dentist would think of filling with gold have been saved for a long time with amalgam.

Phosphate of zinc serves an admirable purpose for the body of a filling where the dentine is soft and needs hardening, or the floor of the cavity is soft and thin and precludes pressure, or the tooth is highly inflamed and needs a soothing, healing covering that can be applied without pressure. In the latter case, it is better to first moisten the cavity with one part oil of cloves and two parts carbolic acid. If the tooth has given much trouble, or is extremely sensitive, but little of the decay should be removed—only that about the orifice and the frail part of the enamel walls. Make sufficient under-cuts to retain the filling, and then fill with phosphate of zinc, mixed rather soft, so as to be put in without much pressure, and left for a few weeks. Then the tooth may be more thoroughly prepared and filled again with the oxyphosphate and plated with gold or alloy. But even in this second operation, it is better not to remove the layers of dentine over the pulp, which will now be found quite leathery. Just remove the actual debris of decay and all decayed dentine near the orifice, cutting back the walls of the enamel so as to leave a firm margin, and success will be assured. In another article under *Treating Exposed Pulps*, we have given in detail our use of phosphate of zinc in these cases. Our general success in saving such teeth during the last four years of our practice, is a proof of the efficiency of the treatment.

Gutta percha comes in very oportunely where the cavities are in sight and not subject to the abrasion of mastication, and the color or expense of gold is an objection. If it has been properly prepared and is skilfully manipulated, a filling of it will be found quite durable, though, of course, not equal to metal. It is peculiarly applicable to cases of decay around the necks of teeth, in mouths subject to the effect of forming acid. It is also sometimes good as a layer of filling against the cervical wall of proximal fillings, where nascent forming

acid, especially nitric, is liable to disintegrate the margin of the cavity. Made quite soft with chloroform, it is a good covering for exposed pulps, after a moistening of the parts with eucalyptus oil; but, in placing this gutta percha, care must be taken to prevent pressure on the pulp.

STUDY SPECIFICALLY EACH CASE.

The cause of tooth decay in each case presented is not sufficiently considered. Few are so ignorant as not to know that there are different phases of caries and that, *therefore,* they must be from different agents, and produced by various oral conditions, but few act accordingly. In *practice* most dentists remove the decay because it is decay, and fill the cavity because it is a cavity, and that is the whole of it, and the last of it.

This should not be. The cause which produced one decay may result in others, if not removed; and, therefore, attention should be given to the condition of the mouth as well as to the particular tooth under treatment. What should we think of a surgeon who would treat an ulcer on the leg without paying any attention to the general system?

As in medicine so in dentistry, every case should be treated specifically, and the cause of trouble, as well as the trouble, should be removed. For instance, suppose caries come from the formation between the teeth of nitric acid. The mere substitution of metal for the caries is not sufficient. More decay will come, both upon the tooth filled and upon its neighbor. And when the patient returns complaining that the filled tooth is again defective, it will not be sufficient to show that the neighboring tooth, though sound when we filled ours, is decayed also. If we had done our whole duty, by counteracting the cause of decay, *neither* of the present defects would probably now exist.

We must be able to discriminate by judiciously treating the teeth and the mouth, and sometimes the whole system. As an intelligent writer says, as an illustration, "If hydrochloric acid corrodes tooth-bone in or out of the mouth, it decomposes the carbonate of lime, while it is decomposed itself; and the results are carbonate acid, water and chloride of calcium, the latter one of the most soluble of salts. At the same time it forms a compound with, or dissolves the subphosphate, while it scarcely interferes with the composition of the animal matter of the bone. But if sulphuric acid is the corrodent, the carbonate is decomposed; but instead of the highly soluble chloride, as above, the almost insoluble sulphate of lime is formed, the subphosphate is not dissolved, and the oxygen and hydrogen is taken from the animal por-

tion, leaving the carbon and nitrogen to dispose of themselves, In short, there is more *decomposition* and less *disintegration* than when hydrochloric acid is the corrodent. Now, how foolish to treat these two cases alike; or, perhaps to neglect all treatment, and only place metal where decay has been, thus allowing caries to continue."

We might multiply examples, but they would all go to prove that we must be intelligent in treating the surroundings of teeth as well as the tooth itself, and in doing this must often treat the whole system, the chemical conditions and the remedies for them. This can only be *learned* by systematic and prolonged study. But on this account should they be neglected? Dentists should be students; in fact they should be students before they are dentists; we are glad to see that those entering our ranks are thus preparing themselves more and more to become useful. But those already in the profession must not cease to be students, especially those who had limited means for early instruction. But however much study we have given these things *in a general way*, we shall not be able to intelligently apply what we know unless we *study specially each case* coming under our observation.

POSSESS THE HABIT OF TAKING PAINS.

When we see a man do easily, quickly and accurately what we have to accomplish with much difficulty and long labor, we sometimes envy him the genius which enables him to work so nimbly, without apparently special thought and attention. But we did not see his first efforts —how clumsy and labored they were, and how faulty in results. If we had we would have said, this is no genius. We have not observed the long, perplexing, persistent training he has given his mind and muscles, and the store of accurate knowledge he has acquired, which causes the results of the habit of great painstaking to appear like genius.

There are not so many geniuses in the world as many suppose,—unless we call a genius one who cuts for himself a path through many difficulties, and comes to the front in spite of the "world, the flesh and the devil;" and comes there with his faculties so well trained for his position, by his very labors, and his whole nature so well developed and matured by long continuance in well-doing that he is master of his position.

The Jews were astonished when they saw John, whom they took for a green country boy, come forth from the wilderness such an intellectual and moral power. The most learned sat at his feet, and their greatest leaders were forced to stand aside while "all men came to him." But they did not know that for thirty years he had secluded himself from their society that he might the better, by austere training, vigorous

study and divine inspiration, come to them "a burning and a shining light."

One of the leading characteristics of a genius who is practical and useful in his sphere, is the habit of great painstaking. If we would become a genius we must give minute attention to every detail of our undertaking—patient thoughtfulness to every phase of it, persevering study under the most severe disadvantages, and a constant endeavor to skill ourselves in its greatest intricacies.

Lord Bacon was one of England's best thinkers and writers. But it is said of him that to accomplish his accurate and polished style, he wrote his articles and re-wrote them with such painstaking, that sometimes they bore no resemblance to his first effort. It was not uncommon for Dr. Adam Clark, in his earlier efforts to revise his literary efforts six or eight times before he would allow them to go to the printers. Newton tells us, "I make my discoveries by always thinking and watching. I make it my daily habit of life." George Stevenson, the great inventor, says his success in the invention of the first engine for a public road was the result of long and careful study, in much poverty and under many difficulties. He worked out many difficult problems in bed, and sometimes for hours would be absorbed in the closest study to see how he could overcome the mechanical obstacles that were in his way. In his old age he would often say to young men, "*The secret of success is perseverance.*"

Hugh Miller, the great scientific genius and intellectual author, spent many years of close study and extensive reading, before he was known to fame, or accomplished anything worthy of it. His masterly work on geology was the result of years of personal research in the fields and mountains, which were often Herculean tasks.

Before McCaulay felt himself prepared to write his great history of England he read almost incessantly for years; and in the collection of his narratives he took so much pains to be accurate that a mere paragraph sometimes engaged his attention for many days.

Charles Dickens was a profuse, rapid writer, but he was rapid because before writing he had thoroughly prepared himself for his work, and he was profuse because his obversations and experiences were of such large range.

Thus with our literary men and our geniuses, they came to be great and useful by taking much pains at every step of their preparation and afterward in every quality of their efforts. Painstaking became a habit with them; and if we would succeed, it must be *our* habit also. We must make it our constant motto, *whatever is worth doing at all is worth doing well.*

DOES TYPE IN PHYSICAL CHARACTER CHANGE?

There are those who think that if, for many generations the first permanent molars are persistently extracted in early life, that the time will come when they will not even germinate, and that their present early decay shows such a tendency. In like manner if, in a certain family, the parents early lose all their teeth for many generations the progeny will finally become edentulus. And so in the race, generally, if we do not take better care of our teeth, and do not use them more, we shall soon have none at all.

As a proof of the probability of such results they instance the fact that where the lateral incisors fail to appear, or are defective in development, we often see this pass from generation to generation; and in some of the lower animals they find evidence of the germs of teeth in the embryo, or soon after birth, which never come to maturity.

We are of opinion, however, that all these instances are no proof of the change of type in physical character. There may be a modification of type, in the defect or deficiency of the lateral incisors, as in dwarfs or humpbacks, or the appearance of other abnormalities, but these disappear. They are no proof of the hypothesis that if certan teeth—the first or the third permanent molars, for instance—are persistently extracted soon after they appear, that, therefore, these will be the more defective in succeeding generations. The one is a defect in pro-creation, the other merely mechanical interference.

We might as well infer, if we should persistently cut off the tails of a certain progeny of dogs and persist in doing so throughout many generations, that finally we should have a breed of no-tailed dogs.

The fact that wisdom teeth are usually short-lived is no proof of the change of type in the race, and that finally we shall lose the wisdom tooth altogether, or that formerly there was still a fourth molar back of the third. Change of habits, food or surroundings may modify size, strength, form, length of life and modification of internal organs, but these changes being removed there is a rebound to the original type. In fact, this tendency of a species to retain its original type is so great, that though severe and singular modifications may be brought about by confinement, abuse and subjection to radical change of climate, food and surroundings, yet let such animals free to enjoy the circumstances their instincts prefer, and in a few generations you have them in all their original glory. Even man is no exception. Though degenerated by sin, dwarfed by weakness and short-lived by abuse, there is a constant tendency to return to longevity, strength and glory. Wherever he shakes himself from his moral shackles, rises to his native element of holiness and feeds on heavenly food, and works out his own salvation as his Father wills of

His own good pleasure, majesty begins to shine out of his very countenance, and there is a purifying fire, a holy inspiration and a renovating force which not only elevates that man, but his progeny, and theirs also if they follow his example. There is a rebound toward the original type.

A medical education for the dentist is good. The better the education in medicine the more thoroughly we are prepared to meet every emergency in dentistry. Yet, manipulative ability is paramount. If the advice of some were followed, a dental student would spend three or four years learning general anatomy, physiology, chemistry, pathology, and materia medica, and only six months or a year in operative dentistry—almost ignoring mechanical dentistry, looking upon this as an outside occupation for an inferior class. If a student has time to become both medically and dentally educated, there is no objection; provided, always, he shall be thorough in the qualifications for his chief business—the care of the teeth. But to make general medicine and other sciences so prominent, and dwarfing the main central necessity of all his studies, is unwise. Perhaps one reason the Austrian and German dentists are behind us as skilled dentists is because they are so far in advance of us as learned physicians. In their preparation they are required to spend four years as general medical students, while their dental course proper is confined to six months.

A narrow escape from death by coal gas, and resuscitation by the use of nitrous oxide gas, comes to us from a cotemporary: Dr. C. S. Hurd, the dentist of Euclid avenue, residing at No. 61 Wood street, together with his family, consisting of his wife and two children, had a very narrow escape from suffocation by coal gas, that should be a warning to others. The top of the base-burner stove was left open the night previous, filling the whole house with the poisonous fumes. The children were taken with vomiting, which aroused Mrs. Hurd, and she went into an adjoining room to look after them, when she fell senseless to the floor. Her fall aroused Dr. Hurd, who was enabled to carry her back to her room, when he went out after some snow to bring her to. On returning to the room he became insensible also. It was then about 4 o'clock. As Dr. Hurd did not make his appearance at the office, his brother and partner, Dr. George Hurd, went to the house, where he found the members of the family all more or less stupefied. Dr. Hurd was unconscious till about noon, when he was finally resuscitated by means of the gas used in the dental establishment. Mrs. Hurd and the children were brought to, but for some time suffered with severe headaches.

Thoughts from the Profession.

ADVICE TO YOUNG DENTISTS.

BY JOHN G. HARPER, D.D.S., ST. LOUIS.

Among your readers are many who are just starting in professional life. Allow me, through your columns to write an open letter in the hope of doing them good. It comes from one who has not been in the profession long enough to have forgotten his earliest struggles to reach the standard of professional excellence.

You have just crossed the threshold and become members of the dental profession. Do all within your power to elevate and purify, and advance its interests. You have selected your place for practice, the next thing is to secure patients. Before you can do this, you must make acquaintances; a thing easily done in a small place, but in the large cities you are lost sight of in the multitude, and, therefore, this is more difficult. It will require wisdom to select proper associates and make a good impression.

If you are a professor of religion associate yourself with the church of your choice. Though you may have no fixed conviction, it is best to attend divine worship, as you thus place yourself upon the side of morality, temperance and kindred virtues.

Should you, by your conduct, convince those around you that you are an honest, conscientious gentleman, you will soon have a good reputation, and it will not be long before you can send forth a few specimens of your skill. Every satisfied patient will be a living advertisement.

Nothing goes against a dentist's success in a country town more than the failure to extract a tooth, which if properly done may bring you many a patient, and an introduction to practice in many good families.

Children should be treated with the greatest consideration. Never place them in the chair to extract a deciduous tooth, if you can avoid it. Never use a forcep in a child's mouth, when a more simple instrument will extract the tooth; and if a forcep must be used, have a small one made specially for this purpose. After a little practice you will be astonished at the teeth you can extract, simply with the fingers.

Your office should be neat and tidy, and it is better to have a young lady assistant. Always wash your hands before doing anything for a patient, and do it in such a manner that the person may know it. Have at hand a clean, fine towel to spread over the bosom of the patient, and fresh napkins to use about the mouth. Keep all instruments

bright and neat for the sake of appearance, cleanliness, and safety. Whatever you do, do your best, regardless of fees, for you have your reputation to make. Do not be backward in drawing your patient's attention to the thoroughness of your operations, and should any friend drop in, you will be doing a very sensible thing to call attention to what you have accomplished, provided the patient is willing. You may ask, shall I advertise? No, sir; not in the ordinary sense. The worst quack will out advertise you. There is no objection to inserting your card in a newspaper, and you will do well to keep before the public by writing short, sensible articles, especially of a professional character.

You have many things to learn yet, and in no way will you be more able to get the new ideas which are being daily discovered than by reading carefully the periodicals of our profession.

Do not hesitate to send your ripest and best thoughts to one of the journals; it will benefit both you and the profession. Carefully preserve the journals and at the close of the volume have them bound. You will find them a valuable part of your professional library. Take care of your office and it will take care of you. Be there during all office hours, with everything in readiness for any emergency of professional duty. It is much better to get to your office too early than to have your patients waiting for you. It will show that you are prompt, industrious and attentive to business; attributes admired by all.

Services should be rendered regardless of price; that is, you should give your best, whether you expect a dollar or ten dollars for an operation. The physician answers the call of the sufferer, not stopping to ask "Cash in advance," or, "What am I to receive for this, and what security have I?" or even, "What is the standing of my patient?" for the poor and the lowly have a claim upon you. You should be happy to relieve suffering, though, of course, anything farther than this should be by mutual understanding. The proper value of professional services is a thing impossible to establish; they should be regulated to a certain extent by the place in which you are located. A dollar will go farther in a small town than five in a large city.

Operations requiring the greatest skill will be liberally paid for, and it is well to call the patient's attention to the difficulties which have to be overcome. Then, when you present your bill he will be prepared to properly estimate its details and be satisfied with its aggregate amount.

Keep a record of all operations; and as you are just beginning, start right by procuring Allport's Dental Register, *one cut to the page*. This you will find very convenient in size and shape. By its use you will be able quickly to refer to what you have done upon any tooth, and thus have a history of every mouth. The longer you practice, the more valuable will these histories become. Present your bill as soon as the ser-

vices are finished. If the course of treatment extend over a great deal of time, present at the first of the month a bill for services rendered to date. Remember quick settlements make long friends, you will thus lose but few fees.

The profession is indebted to Dr. J. N. Crouse, of Chicago, for a paper on *The Duty of Practitioners to Each Other*, published in *The Missouri Dental Journal*, vol. vii, page 85, he says: "The vocation we have chosen is of such a nature that outsiders can know but little of it; hence trickery seeks shelter under its cover, and dishonesty is so often well rewarded that our ranks have in them knaves and fools, ignorant of the first principles of dentistry. These are constantly victimising the uninformed; reaping gain for themselves and loading the profession with disgrace. * * * Another duty of every practitioner is to associate himself with his fellows in some organization for mutual improvement. * * * It is a duty he owes his patients to avail himsell of every opportunity which offers for improvement. Again, we are frequently brought in contact with patients from other offices, and it is often perplexing to know what our duty is. If the operations are what they should be, an honest practitioner will take pleasure in commending them. But in quite a large majority of cases, we find that work has been improperly done. Now what course ought we to pursue in such cases? It is always unpleasant to condemn the work of another practitioner, but when a great wrong has been done, either willfully or otherwise, we should not hesitate. The work must be repaired, and some explanation for this must be made. I know that it is often said that one dentist should never speak disparagingly of another, but why not? let me ask; what obligation are we under to screen poor work or workers? * * * It seems to me that there is but one course for an honest man to pursue, and that is to remedy as far as possible the evil which has been done and teach the patient to discriminate in future between competent and incompetent practitioners. We should be very guarded, however, lest we sometimes judge uncharitably, not knowing all the facts and circumstances of the case; and whenever there is any doubt to give the operator the benefit of that doubt."

In conclusion, I will say in the language of Dr. Atkinson, "Give me honesty and I'll prophesy capacity;" and capacity will bring success. But you must remember that both capacity and honesty are active elements. Capacity means much study to keep well informed, and honesty much thoroughness to do your work well. And though these will give you what you may be proud of in skill and success, you should not be contented with any present attainments. You must be always striving for still greater ability, dignity and usefulness.

"SHALL WE ABANDON RUBBER?"

BY J. M. COMEGYS, ST ALBANS, VERMONT.

ED. ITEMS:—In your April editorial under the above caption, enumerating the advantages in using rubber you say: "It is the most plastic material we have." Is it more so than Reese's metal, or metals similar to his? I hardly think so. After using a *cast* metal for 27 years, I find I cannot get as perfect a fit without an air-chamber (my favorite way of making teeth, because the air chamber makes an unequal capillary circulation), with the rubber as with a cast metal.

In your second reason why rubber should not be abandoned, you say it is the most *elastic* material! In the days when we made temporary sets of teeth on gutta percha (without vulcanizing) the elastic feature was really a good thing; for we used plain teeth, and there was little or no danger of breakage. But an elastic material, to be really of any benefit because it *is* elastic, will crack all the block gum teeth we can put upon it. The elastic feature of the rubber really does not help the case, for it is not sufficiently elastic to cling to the mouth if great pressure is brought to bear on one side, any more than a good fitting continuous gum set; and the clinging, twisting and warping would most certainly crack the gums of the block teeth. I will undertake to make a continuous gum set of teeth (which is certainly not elastic) fit any mouth as well as any elastic rubber plate, *at the time it is made*, and will fit *much better* in two years after being made, than the rubber plate.

You say in your third point that it is the "strongest material used" for a base for artificial teeth. I must say that my experience is just the opposite, even after following all the directions as to vulcanizing, given by so many different dentists, even when using "good rubber." The rubber made some twenty years ago, and sold by Dr. Franklin, and known as "The American Hard Rubber Co.'s rubber," was really a superior article as far as strength was concerned; but I can find no such rubber in the market now, though I have searched long for it. Not only do my own plates break, but I am frequently called upon to repair the work of other dentists, showing it was not my fault that plates going from my office were not as strong as rubber plates of twenty years ago.

Yes, the rubber is "light," I will admit; but I will assert, at the same time, that a good fitting continuous gum set of teeth is not noticed in the mouth on account of its extra weight. That argument is frequently brought to bear on the fears of people who are really satisfied rubber is injurious and would like metal, by dentists who can do no other kink of work but the rubber. It has been my good fortune during the past eight or ten years to test that to my entire satisfaction. I have made within that time a good many continuous gum sets, mostly

upper dentures, for parties who had previously worn rubber, and some of them were quite old and nervous persons. Never *once* has anything been said to me in regard to the weight of the new work; no exertion is required to keep it in place.

Moreover, many of us feel sure that injury results from constantly wearing a non-conducting material in the mouth. A gentleman wrote me from one of our Vermont cities four years ago, that his wife had a complete rubber set of teeth that did her good service, so far as mastication and speech were concerned, but she was very much troubled with a heated and calomel sore mouth. He said the dentists in his vicinity told him the rubber was not the cause, but feeling dissatisfied, he had been advised to write to me. I made for her two sets on platinum plates. In about three months he wrote to me: "My wife's trouble, which I attribute to the metal plates, is all gone." More than a year after that he called at my office, and said he desired to thank me "for making his wife comfortable about the mouth." I have the cast of a mouth in my office, where a person wore a rubber set for thirteen years, which exhibits a remarkable degradation of the mucous structures. The roof of the mouth is gridironed with cicatricial tissues, and more than this, a periostitis has ensued, producing necrosis of the bony roof. A physician in one of our eastern cities, a gentleman who, for years, filled important chairs in two medical colleges, and who is also clinical instructor in a large hospital, writes me: "You are right in regard to the evil effects of wearing rubber. I tried it, but could not endure it. It affected my whole system, and am now wearing platinum. I know a lady whose bony roof of mouth is in a most distressing state, caused by wearing a rubber plate." I never saw a metal plate produce any evil affection. My patients who have had sets changed from rubber to metal—and they are numerous—say it is so delightful to feel the cool air in the roof of their mouths as they breath, and the coolness of water as they drink. All manufacturers claim that their rubber is good, but much of it seems to be loaded with kaolin and other earths. Where shall we go for the good rubber of which you speak? Kubber can be, and is, adulterated, but only good rubber can be used, for impure metals can not be worked. So completely convinced am I that the mouth will become diseased by inserting rubber, that if persons contemplate metal work for permanent sets, I always use metal for temporary work, without making any extra charge.

"*The rule should be laid down* that every exposed pulp, which is not on the verge of death or beyond all hope, should have a chance for life and usefulness by the most patient and intelligent treatment.

DR. A. H THOMPSON.

Topeka, Kansas.

SOME OF THE OPPORTUNITIES, RESPONSIBILITIES AND ENCOURAGEMENTS OF LIFE.

BY DR. C. A. BRACKETT, OF NEWPORT, R. I.

In the great drama of this life we may adopt a much worse policy than the earnest, faithful doing of the duty that lies nearest, and then the next, and the next, persistently; just as one crossing a broad, shallow stream in a mist, on stepping-stones, finds the way a step at a time till the other shore is gained. Goethe wisely says: "Man is not born to solve the problem of the universe, but to find out what he has to do, and to restrain himself within the limits of his comprehension."

We of to-day are greatly favored in the times in which we live. The multiplicity of books and of educational institutions, general and special, the accumulation of material resources, the possession of more time apart from that consumed in the struggle for mere existence, the marvellous achievement of science, the progress of investigation, the revelation of truth of every kind, and all the helps and conveniences, now indispensable, which these have given our daily life, suggest a few of our many privileges. Think that a hundred years ago there were no railroads, no steam navigation, no telegraph, no telephone, no anæsthetics, little knowledge of electricity, no friction matches even—none of the upward of two hundred and seventy-three thousand ameliorating inventions whose specifications are recorded in the archives of the Patent Office, and which have contributed so incalculably to the amount of work which the world has been able to do, and to the amount of material comfort which it has enjoyed and is enjoying. A hundred years ago, even the dentist, as a product of American soil, had hardly begun to exist. More than one small boy has had intervals of wishing that himself had lived in the last century.

But in all this marvellous, unprecedented progress of the recent past, only the beginning has been made in the wonders of discovery and invention that the unresting spirit of those who quit themselves like men will bring out for the convenience and blessing of the world in the future. In this there is unlimited opportunity for accomplishment. Such simple processes as hewing wood, drawing water, building fire, we have had repeatedly shown susceptible of improvement, and they may be improved again. Hardly an appliance, a material, or a process is yet made as nearly perfect as it can be. We need to open our eyes that we may see, and sharpen our wits that we may understand something of what may be revealed to us. Men saw apples fall to the earth many times before they learned the great lesson that Newton read therein. They saw many flashes of lightning before Franklin led it quietly down his kite-string, and demonstrated that even it respects a silken cord, and may be harnessed to do man's bidding.

Plato's description of man as a biped without feathers, and even with flat nails, comprehends but a small portion of the characteristics distinguishing him from the rest of the animal kingdom. We sometimes hear low and mean actions of men spoken of as beastly. Such expressions are a vile slander on the beast. They are given certain natures which they have no power to change. A lion must be a lion, a hyena a hyena, a sheep a sheep, a musquito a musquito. Indeed a man might do well to imitate the good qualities of many of the lower orders—the high spirit, ambition and ready service of the horse, the patience and steady plodding of the ox, the faithfulness to trusts and abiding friendship of the dog, the far-sightedness and perseverance of the hawk, the industry and provision for the future of the ant and the bee, the light-heartedness and cheeriness of singing birds, the courage to undertake great labors, with means commensurate only in energy, of the beaver, the steady persistence to an end, though its attainment be many times thwarted and the same work have to be done over and over again, of the spider. Animals, too, are content to work each in his appointed sphere. These are not victims of the alcohol habit, the opium habit, or, shall I say, the tobacco habit, and they are not often guilty of abusing any of their natural powers. But man is given a different degree of intelligence, knowledge of good and of evil, capacity to restrain his lower nature, and to cultivate and make better his higher.

The opportunities of this life are not all material. There is the opportunity for endless and unlimited character building, for moulding and developing all that better part of us which is not material, which cannot die, and whose future existence must be so largely affected by the way in which this opportunity is improved. There is the opportunity for helping others in innumerable ways, for lessening pain, for relieving trouble, for soothing sorrow, for giving cheer, for pointing out encouragement, for conferring happiness. And here may be produced results grander and more enduring than anything that the material world can show; and the agencies are so simple, the expenditure in proportion to results, so trifling. A smile, a kind word, a flower, an expression of appreciation, of approval, of praise, of friendship. How inspiriting is a little deserved commendation for a child! and—

> "Men are but children of a larger growth;
> Our appetites are apt to change as theirs,
> And full as craving, too, and full as vain."

One of Chicago's successful men, lawyer, railroad president, business man, told me last summer that in his beginning, after one of his early appearances in court, a certain judge, for whom he had great respect, remarked to some one so that it came to his ears, "That W——

will make a smart lawyer." "Why, on the strength of that one remark," said W——, "I worked like a Trojan for a whole year."

Multitudes of instances have occurred in which so little a thing as this has changed entirely the current of a life, and made all the difference between despair and courage, between dependence and self-support, between listlessness and energy, between vice and virtue, between failure and success, between misery and happiness. Influence may be exerted to depress and hinder as well as to encourage and sustain. Put yourself in the place of an actress making a *debut* in a strange city, before audiences in the highest degree exacting, and see if you are not so overwhelmed by the avalanche of adverse criticisms as to be incapable of doing justice to the degree of capacity you actually possess, unless, indeed, you have the strength to rise up as did Disraeli, when ridiculed and scorned in his weak early attempts to make a speech in the House of Commons, and say, "The time will come when you will hear me," and make the promise good.

This matter of influence is an immense one, and we cannot discuss it now. We were speaking of opportunities, and in connection with this question of helpfulness, will only stop to say that there are constantly, daily and hourly, arising occasions when small investments in these little things may realize incalculable dividends for ourselves, for those around us, and for the world.

What else shall we say of opportunities, except that in them we are given all for which self-reliant human nature can reasonably ask? In the little things of daily life we have a better than Archimedean chance to move the world, not grossly, but by brightening the little spot of earth on which our lot may be cast, and sweetening the little atmosphere about us.

A friend, a busy and earnest physician, of western Massachusetts, enthusiastically said to me on Thanksgiving day: "If we would only improve our time and our capacities to their utmost, we might be gods instead of men."

JEFFERSON, Wis., April 6th, 1883.

ED. ITEMS:—I have had more neuralgic cases to treat this season than ever before. One of the most successful remedies I have used is to mix a small quantity of Iodoform with Welch's Phosphate, which seems to give it a finer grain and does not hinder its setting, but makes it harder, if anything. This placed over an exposed pulp or where we have had occasion to remove a filling for treatment, has always been very sure to give the desired relief when other modes have been doubtful or failed. It would not be a bad permanent filling to leave in many cases, I think.

Yours, H. C. MANSFIELD.

NEURALGIA AND QUININE.

Dr. Swan, of Ill. says :—"I have had a case in hand for some time of sloughing of the gums. The gentleman has been treated for years for a severe pain in his head. It seems to be on the outside of the head, and not as if it were in the brain. When he first came a first upper molar was tender and careful examination showed it to be dead. I thought I had discovered the cause of all the trouble. Opening of the tooth and cleansing of the pulp canals gave relief for a time, but he soon returned. He was not relieved by changes of dressings, and after two or three days of suffering, I removed the tooth; but there was no relief from pain, and the wound did not heal readily. There was some necrosed bone, and finally all the outer portion of alveolar process from the wisdom tooth to the bicuspid was removed. I have since removed the bicuspid. There was some exostosis on the roots of both the teeth removed, but the trouble is not yet relieved. Like Dr. Crouse, I have sometimes been laughed at for prescribing quinine. I once filled a large cavity in a molar tooth; an unusually severe operation. There was no pain for several days after the operation; but later there was pain each day at about 4 o'clock P. M. coming on suddenly, with severe throbbing, and subsiding gradually. I was satisfied that the pulp was in pretty good condition, and prescribed two-gr. pills of quinine every hour till well under the impression of it. There has never been a recurrence of the pain, and the pulp is still alive. I gave it without much certain knowledge as to the exact mode of its action, but hoped for its anti-periodic effect, and have often used it since with good results."

OTHER CASES.

A lady came to our town who had spent a great deal of money, and taken a great deal of trouble for the treatment of sore eyes. The doctor brought her to me to see if there was anything the matter with her teeth. They appeared to be very good, but I was anxious to find *something* the matter with them, and after careful search succeeded in probing an exposed pulp through an obscure cavity in a wisdom tooth. The removal of this tooth cured the sore eyes.—*Dr. M. H. Patton, Springfield, Ill.*

I have prescribed quinine in three cases that occur now to my mind, in which relief was immediate and complete, and in other cases with modification of the trouble. I have given it only in cases when I suspected malarial trouble.—*Dr. G. H. Cushing, of Chicago, Ill.*

An old lady came to have four or five loose under front teeth removed—all that remained in her mouth. Their extraction was followed by severe *periodical* hemorrhage, recurring at the same time every day. I used persulphate of iron, and prescribed quinine, beginning five or

six hours before the period. The hemorrhage recurred, and they sent for me, when I found that the quinine had not been taken. I made her take it the next time, and there was no after recurrence. In another case, a lady very hard of hearing came to have a lower wisdom tooth filled on the buccal side. I found the tooth very sensitive. Obtunding the sensitiveness by means of oil of cloves and morphine, was followed by immediate recovery of hearing.—*Dr. H. A. Townsend, Pontiac, Ill.*

ELECTRICITY AND NERVE-FORCE.

BY DR. J. F. SANBORN, TABOR, IOWA.

The analogy between galvanic electricity and nerve-force is apparent when considered in all its various manifestations.

Let us consider a few of them:

1st. Some persons are so abundantly supplied with nerve-force or vital electricity, that they are like a charged Leyden jar, and have been known to pass to another a sufficient quantity of electricity to produce a spark that could be both seen and heard.

2d. Sometime since an explosion took place in a mine that could be accounted for only on the supposition that it was occasioned by vital electricity.

3d. The arteries are tubes where the blood is continuously circulating or changing its relative position as to place; but in the nerves there is no such change of position of the matter that constitutes their interior. Whatever the motion is, it is the transmission of an impulse that makes an impression on consciousness at the termination of the nerve fiber, as was the case with the suspended balls of ivory.

In the use of the galvanic battery on a person, if the current is not so strong as to overload the nerves, already charged with the vital current, and if it is passed in the direction of the natural flow, it is transmitted without pain; but pass the current in the opposite direction to the natural course of the nerves, and pain is the result. In the normal condition of vital action, the impulse is in quantity just enough to supply the demand, and is continuous in its flow, which is always in the same direction.

A lightning rod will conduct the electric charge from the cloud to the earth in the same quiet and unobserved manner; but over-charge it, and the rod is melted and destroyed. So if the current of the battery employed is too strong, or if it is passed in the wrong direction, pain is the result.

The afferent nerves convey the vital electric current from the peripheries to the center, and also sensations in the same direction.

The efferent nerves carry will-power or brain-force to the muscles,

and cause them to contract. Suspend the current and the muscles relax. In like manner the telegraph, when the connection is complete, acts as a messenger, and attracts; but as soon as the connection is broken it ceases to act.

When the current of artificial galvanic electricity passes in the afferent nerves from the extremities toward the center, or in the direction of the natural current, it passes like a vessel down stream; but when it is forced to pass in the opposite direction, it is like forcing the vessel up stream against the powerful flow of the river. A ruffled wave and a resisting current is the result, and pain, the shriek of suffering nature for relief, is most emphatically realized.

The use of the galvanic battery to supply a deficiency of nerve-force is like administering phosphate of lime to a child who has a deficiency of that indispensable article in its osseous structure.

If you would nourish bones that are deficient in the phosphates, you must use that part of the cereals which contains it in the greatest abundance in an organized form, so that it can be appropriated for that use.

A distinction exists between organic and inorganic—the artificial and the natural—when the vital organism is to use it. The same principle will apply to the use of the galvanic battery; its judicious use may increase vital action, and indirectly supply nerve-force by increasing, in a natural manner, the break-down of tissue; but never by a direct supply of it to the brain or nerves.

There are persons who are so abundantly supplied with vital force that they are enabled to impart it to others, as a banker may supply funds to the bankrupt; and if the nerve bankrupt be properly instructed as to the conserving of his nerve-force, he may be benefitted thereby; but if, like the natural-born spendthrift, he expends all his own nerve-force, and all he can obtain from others, as fast as he can obtain it, such an imparting of one's vitality is "love's labor lost," and a useless expenditure.

The Organic and Inorganic.—In the inorganic world firmness and durability are prime qualities, while in the organic living structure instability and unceasing change are the marked characteristics.

In the organic world we see that the sum of all the forces culminates in light, or the greatest degree of motion; equal to 192,500 miles a second. In living structure the climax of all the forces is life; with a moderate degree of continuous action from the first inception of vital motion till it ceases in death.

The living principle is an active force, or a sum of active forces, and the result is a continuous action, which is life. The cessation of this activity is death.

Health is where the action is in perfect balance in all its parts.

The cause of disease is a loss or disturbance of this balance, and disease is nature's effort to restore the balance; while death is the cessation of vital changes.

Nature's law of life and cure is true obedience to physiological law.

THE FIRST PERMANENT MOLAR,

BY DR. W. C. BARRETT, OF BUFFALO.

The general subject of the treatment of sixth year molars and their preservation or their sacrifice, has been a vexed question in dentistry for some time. I know that qualified practitioners, men who are ordinarily conservative in their treatment of other teeth, sometimes advocate the extraction of sixth year molars as a rule, whether decayed or not. Their argument is this, that these teeth are apt to be attacked by caries, and that their salvation is rather problematical; that by their early sacrifice the neighboring teeth may be brought into line and become serviceable, when otherwise there would be an undue crowding. It has always seemed to me, that this line of reasoning was very fallacious. I have always thought that in the development of the human species, there were not too many teeth; that the great prototype, the highest type of development, is more than thirty-two teeth, that it is forty-eight teeth, with more permanent molars. In men, however, we have but thirty-two teeth, and the sixth year molar occupies the most important position in the mastication of the food. It is immediately opposite the mouth of the great duct, which supplies the principal portion of the saliva for the preparation of the food, and we all know that saliva has a most important part to perform in the office of digestion. It is not simply that it prepares the food for deglutition. It is not that it keeps the mouth in a moist condition. It plays a most important part in changing the starch of food to sugar. This tooth, the sixth year molar, is directly opposite the mouth of Steno's duct; therefore it is the most important tooth, in that point of view, as in mastication, the food is more freely mixed with the saliva which exudes and is therefore in a more proper condition for digestion. Then it is the largest tooth in the center of the arch, and when that tooth is gone, the principal one in the whole wall has been removed, although, if it be taken out sufficiently early, the second molar will come forward and, in a great measure, take its place. Yet, in this case, it almost universally stands at an angle. Consequently, I think the sixth year molar should be retained, and such practitioners as recommend its removal are in error, at least from my standpoint.

With reference to decay, I think the idea is becoming more and more prevalent that it is nothing more or less than chemical solution and

disintegration. There are other things, of course, which hasten or hinder it. An hereditary diathesis has its influence. Yet the main principle involved is a chemical principle, and the decay of the teeth is mainly a solution of the lime salts, through the action of such acids as are formed in the mouth.—*Transactions of the Michigan Dental Society.*

"THE BUSINESS QUALIFICATIONS OF PROFESSIONAL MEN."

———, Kansas, April 3, 1883.

EDITOR ITEMS OF INTEREST: I have just noticed in No. 3 of *The Dental Practitioner* something that disgusts me past endurance. I refer to remarks by the individual who essays to edify us concerning the "Business Qualifications of Professional Men." He says:

"Remember, that though in many ways we are public servants, we are never bound to serve all who may call upon us. Indeed great discretion and judgment is necessary in deciding who we are willing to have on our roll of patients. Reference here is particularly made to cases like the following; Ladies of wealth and refinement will not infrequently ask us to give an appointment to their maid or nurse, explaining that they wouid not ask such a favor except for the fact that she has been in their employ for some time, and is altogether nice in person; and that their interest is such that they are willing themselves to settle the bill at our usual fees. In all such cases, we will find that our own interests are best served, in the long run, by declining to operate. It need not be done brusquely, for in a pleasant way we can say to them, that it would give us great pleasure to do as they request, but for a rule made long ago by us not to operate for such; and that having never broken it, we would not like to do so now."

The whole paragraph is a slander upon the intelligence of woman, for no lady of refinement ever did or ever will disgrace her womanhood by making such a request and then *apologize* for doing so. A woman belonging to the class the aforesaid individual evidently does might, but a lady of intelligence and refinement, never.

What! Refuse to operate for a tidy respectable woman because she is at service? One who, by propriety of conduct, intelligence, and fidelity through years of service, has always retained the respect and kindly interest of her employer! *Refuse to operate for her*, simply, because she is compelled, or chooses, to labor for her own support?

On the same ground, I suppose, a surgeon or a physician should refuse to operate or prescribe for the relief of her bodily sufferings; or a minister of the gospel refuse spiritual advice and consolation. If the poor fellow who is the author of this paragraph, ever had a mother half as respectable as one of these, in simple mercy it is to be hoped she

passed "Beyond the River" while he was yet in his infancy, and was saved the humiliation of ever knowing herself responsible for the existence of such a—a—oh, well, just *you* say it if you think you can do it justice.

Whatever you conclude to style him, he is certainly out of his element in this country—this country is altogether too common for him. If, when a few years ago, Dr. Evans was D.D.G. to the royal family of France, he had advertised for an assistant to clean the blood and filth of royalty from the spittoons of his office, I fear Philadelphia would have sufferered severely, for I opine this model of professional dignity(?) would have rapped promptly at Dr. Evans' door for *that job*, even if he had had to borrow money of some poor work girl to pay for a steerage passage over.

The Dental Practitioner being a gratuitous courtesy, one does not like to be too rough on *it*; but wont *you* please ask its editor, out of respect for the profession, out of respect for common horse sense and decency to please spare us further infliction from that source.

Respectfully yours,

KANSAN.

TRIGEMINAL NEURALGIA AND ITS TREATMENT.

BY DR. T. W. BROPHY, CHICAGO.

I advance no new theories, but relate a few cases I believe to be of deep interest to us as a profession, and which have not heretofore been noticed.

There are few persons affected with neuralgia, as the term is generally understood, that seek the services of the practitioner of dentistry to obtain relief. When a patient thus affected presents himself to us, he usually denominates his trouble "toothache," and believes that the removal of a certain tooth or teeth, will effect a permanent cure; when in fact, the the teeth in some instances are in no way implicated, the pain emanating from other causes. It is in the treatment of such cases that the best judgment is demanded, the causes of which are sometimes very obscure, and which are frequently erroneously attributed to the teeth. All members of our profession have no doubt seen persons whose teeth have been removed by advice of their physician, with a view of being relieved from general neuralgia. The teeth of these persons were pretty good, none indeed being sufficiently affected to produce odontalgia. We have observed that in some such cases the result desired was not obtained, the pain not being abated. On the contrary, the removal of the teeth has been to the patient a serious and irretrievable loss, all of which must be regarded as the result of failure, or ability, to correctly diagnosticate the condition.

We have also seen persons, who have been under treatment for neu-

ralgia for months, and in some instances years, taking medicine almost daily, and obtaining only temporary relief, if any; when upon close examination of the teeth, removing all the fangs which are not sufficiently firm to be crowned, and properly treating and filling such teeth as can be preserved, the neuralgia quietly, and in many cases effectually passes away. The exciting causes of *true* neuralgia are usually a damp, cold atmosphere, miasmatic influences, or an anæmic condition of the system; to this we might add syphilis. As before stated, the species which we are most frequently called upon to treat, emanates from some lesion, or the presence of some substance which impinges upon the nerve-sheath, thus causing pain.

Of these causes, by far the most common is nervous odontalgia. However, it may proceed from periostitis, exostosis, the contracted arch and crowded teeth, partial calcification of the pulp, pulp-nodules, or fractures of the maxillary bones, causing spiculæ of bone to come in contact with, and irritate the nerve. This latter condition may, and doubtless does result in some cases, from the unskilful use of the forceps. Neuralgia may be induced by a cicatrix, which contracts the soft tissues adjacent to the nerve, thus producing pressure and consequently pain.

Indeed it may be caused by anything which interferes with the organic functions of life. What then shall the first step be to alleviate our suffering patients from this dreaded and terrible affection? Answer: search for and remove the cause; and since trigeminal neuralgia originates most frequently from carious teeth, our attention should always be directed to a thorough diagnosis of the mouth. If the teeth present an appearance of soundness, be not satisfied with this, as there are many cases where caries are proximately situated, and so obscure that time is required to secure sufficient space to accurately diagnose. Some will doubtless say, why do you speak of odontalgia or exposed pulps as the origin of neuralgia? Why do you confound the terms? or how is odontalgia distinguished from neuralgia? In answer I will say the sensations produced by neuralgia are the same and identical with nervous odontalgia.

We have all been consulted with reference to pain, described by our patients as being of the neuralgic type, periodical and lancinating. The patient is unable to locate it, but imagines that it may possibly proceed from the teeth. A close examination reveals along the surface of a tooth adjacent to its neighbor, and in the majority of cases just about the free margin of the gum (which is absorbed) and underneath the enamel, carios dentos; this may or may not be broken down. The demineralized tooth-substance at this point may be in its perfect original shape, but by probing it is found to be a soft, gelatinous mass, which easily allows infiltration of the secretions of the

mouth, hence the source of pain. Such cases are most frequently observable in patients of middle or advanced age. In case fractures of the bone have occurred, a free incision should be made and the disconnected bone removed. Some of the most aggravating cases of neuralgia are due to fractures of the bones, necrosis following, with a deposition of new or secondary bone, which so involves the sequestrum that the efforts of nature cannot expel it.

The skill of the surgeon, therefore, must come to the rescue. The effect of the so-called pulp-nodules and partial calcification of the pulp upon the nerves supplying the teeth is familiar to all. We realize the necessity of relieving the suffering, and yet, our task is one surrounded with difficulty of the most complicated nature, more especially so when the patient is unable to locate the seat or origin of the pain. To diagnose correctly the cause of neuralgia, when due to pulp-nodules, when no particular location of the pain can be designated by the patient, is a task worthy of the most profound observer, and the most thorough and accurate diagnostician. Fortunately, however, cases where the pain cannot be located are rare. The teeth containing these excresences or nodules within the pulp-canal, are usually sensitive to the tap of an instrument. The pain is increased by quick changes of temperature, or upon hard pressure. The irritation of the tooth-pulp and the dental periosteum, occasioned by these nodules, is followed by an elongation of the tooth, sometimes slight, but very distinct. This is probably the most marked symptom of the disturbance in question. These nodules doubtless are produced by the odontoblastic membrane which has been subjected to gradual, persistent, prolonged, though slightly irritating influences.

The treatment for this source of nerve-pain is, of course, to remove the cause, and that can be accomplished by drilling to the pulp-canal and carefully removing the little pebble-like, ossific bodies, with a very fine-pointed excavator. If, however, the pain experienced in their removal is very severe—as it generally is—the arsenious paste may be applied, after first reducing the congestion of the blood-vessels, then the nodules can be painlessly removed and the roots treated according to the approved methods of the day.

Exostosis of the fangs of the teeth, a fruitful source of neuralgia is, indeed, as difficult to diagnosticate as pulp-nodules, unless the fangs affected are enlarged to that extent which clearly locates and defines the affection. In exostosis, as in pulp-nodules, it is gratifying to say the pain is more localized than diffused.

The sensation produced by dental exostosis is that of fullness, and it is when the alveolus does not yield by absorption, in proportion to the growth of the tumor, that neuralgia is produced, sometimes of the most

painful type, and if not understood it may be treated an indefinite time without any beneficial effects.

My experience and observations teach me that exostosis results in a large majority of cases, from irritation of long standing, and final death of the pulp. Sometimes it occurs upon the fangs of perfectly sound teeth, but far more numerous are the cases where a portion, or the whole of the crown of the tooth, has been destroyed by caries. A sound tooth affected with exostosis not always, but usually, has characteristics differing in a marked degree from its fellows, and it is through this medium the offending member is pointed out. I allude to the consolidation, in the whole tooth structure, of calcium salts which renders the resisting force of the organs, to the instruments, greater than is ordinary, and far in excess of the adjacent teeth. This condition can usually be recognized by the experienced eye.

The treatment for neuralgia resulting from exostosis is to remove the affected tooth. Some of our professional brothers, with pride in preserving such teeth, might extract it, remove the tumor and replace the tooth. The fears of tetanus, however, and a vivid recollection of the loss of a patient by this disease, by a professionial friend who had replaced teeth after removing the exostosis, would debar me from such a practice.

Mr. Salter, in his admirable work on "Dental Pathology and Surgery," describes a case of intense neuralgia of the eye-ball and face, which caused a change in the color of the iris, resulting from carious teeth.

This case was indeed remarkable. It is so important to us, and illustrates so well how men of the highest medical skill sometimes fail in making a correct diagnosis of lesions, or affections, which have their origin in the teeth, that I shall quote it. He says, "Mrs. C., aged thirty years, was sent to me by Dr. Oldam. She was suffering from neuralgia of extraordinary severity, affecting the left eye-ball, and the left side of the head and face. She had suffered almost continuously for ten years, the attack commencing on her recovery from a bad confinement; and no medicines had given her distinct relief. The most singular and interesting part of the case is, that the iris of the affected eye has completely changed color under the influence of the continued pain. Both her eyes were originally of a deep and bright hazel color; the iris of the right eye remains as it was, but the left has changed to a dull gray, without any trace of the original hue. This change has occurred progressively till the eyes are now as if belonging to two people of totally different complexion. No artificial painting could exhibit a more strange and striking contrast. When this lady came to me she was in a pitable condition, suffering such agony as I have seldom witnessed, and worn out and exhausted by the continual sleep-

lessness which the pain had occasioned. Upon examining her mouth I found that the left lower dens-sapientia and the first upper bicuspid were badly carious. I removed these teeth, and the operation was attended by a terrible paroxysm of neuralgia, but upon recovery from this the patient expressed her conviction that the extraction of the teeth had cured her, and so it proved. For three months she was entirely free from pain; she had scarcely known such immunity, even for three days, since her neuralgic sufferings commenced, ten years before. As she expressed it, 'it was like a new life to her.' On the eighth of October the old pain came back, and my patient came to me on the tenth, just in the condition she had been at first. I now found that the second upper bicuspid was carious, and intensely tender. Upon its removal a considerable exostosis was seen on the root. The pain vanished with the tooth, and the patient wrote to me a week after saying she was quite well. The iris of the left eye, however, has never returned to its original color; its vision has not been affected."

UNITING GOLD TO AMALGAM IN TOOTH FILLING.

BY N. W. KINGSLEY, D.D.S., OF NEW YORK.

I would like to refer to a use I have been making of amalgam for several years, and which I reported to the State Society some four or five years ago. I advocated at that time that in many instances of large cavities on approximal surfaces,—of bicuspids and molars particularly,—they should be partly filled with amalgam, to be followed at the same sitting with gold, carrying out the filling to the grinding surface of the tooth, if one desired to avoid a full amalgam filling. Without going into a lengthy discussion of the arguments in favor, or the objections that might be offered, let me say that I have seen a great many of those fillings, and have watched them with much solicitude and anxiety, but I have never seen a single instance where there has been any recurrrence of decay at the cervical edge of the cavity. In nearly every case that I have seen, I have found the amalgam discolored on the surface, but the gold as bright as any gold filling, and the tooth preserved perfectly from further decay.

I have been querying, why this result; whether it was attributable entirely to the fact that with the amalgam I got perhaps a closer adaptation to the cervical edge of the cavity than I would with gold, or whether it was owing to some galvanic condition of the different metals in contact or what? But this I do know, that sooner or later the majority of operations, under like circumstances, when made with gold, are giving out at that portion of the cavity, no matter by whom they are made. I say a majority, not because I have had an opportunity of examining all the fillings made by every operator, but because I am

constantly seeing the work of the most skilful operators in gold giving out at the point referred to, within a few years. There is not a dentist who is not seeing this almost daily, and among his own patients, if he would but have the candor to admit it.

I have been puzzled for an explanation of the success where amalgam has been used in this manner. There is no evidence of shrinkage of the amalgam that is placed in the upper part of the cavity. Whatever amalgam may do under other circumstances, that amalgam shows no shrinkage after it is put in. It remains perfectly tight, and the tooth does not discolor in contact with it. In filling a tooth in this way the amalgam occupies a third or a half of the cavity, and the gold is immediately forced into it. For some little time the gold will absorb the mercury and take up all the excess. After that ceases the gold shows its true gold appearance, and unites or welds in the usual way. The filling can be finished as soon as the gold is packed. The amalgam will be found sufficiently hard to be finished up to the cervical edge. We see here two results: one is that the gold has taken up all the excess of the mercury that can possibly be taken from the mass of amalgam, preventing the possibility of shrinkage; and, secondly, such a filling is in a better condition to make a perfect flush edge at the cervical border. There is little or no risk of the difficulty so often found with gold fillings, of the filling standing out and forming a lodgment for foreign matters, which will end in decay, because the amalgam has not become so hard but that it can be easily brought flush with the body of the tooth. This may be the explanation of the results that I believe will almost invariably attend such operations. I spoke of this before the State Society a few years since with some timidity, for the reason that there is such a prejudice in the minds of almost every one against amalgam,—and especially as the charge is often made that amalgam is only used by those who cannot put in a gold filling. It was not for the reason that gold could not be used, but because I saw gold fillings were constantly giving out, that I felt obliged to resort to something for the good of the patient, and the result has been so successful and uniform that I felt it a duty to give sombody else the benefit of it.

[We have often filled teeth as above described with good results. We rather prefer to fill the cavity with alloy and after it has set cut away a little and plate with gold.—Ed.]

In regard to the change in the Items, I like it very much, and have often regretted that it had not this form before. Am now enabled to preserve them for reference, and trust you will take another step in advance of other dental magazine publishers, and insert a complete, intelligible index at the end of every year.

Stick to the plan of printing only the pith of good, practical articles from whatever source. Dentists who are busy have no time to read long articles for a penny's worth of information. The popular dental journal in America will be the one which is a monthly encyclopedia of dental knowledge and progress all over the world. God speed such a journal. Yours, VAN HORNE.

THE ACTION OF MEDICAMENTS ON THE DENTAL PULP.

BY DR. BUCKINGHAM, OF PHILADELPHIA.

A base and an acid combine and form a salt, and thus, when we bring chloride of zinc and oxide of zinc in contact, we have a combination of the kind taking place. If the acid and base be of the same strength, they form a neutral salt. We have an example of this kind in nitric acid and potassium forming saltpetre. But with a strong acid and weak base, we have the acid always present, and, *vice versa*, with strong base and weak acid.

Now, the tooth cannot be in an absolutely dry condition. The bottom of a filling does not remain perfectly dry, as there is circulation necessarily going on here all the time. I don't say that it is water, but think it is the liquor sanguinis of the blood, as that liquor nourishes the dentine. It does not rush through the dentine at great speed, but makes its way slowly. The tubes are all filled up with semi-solid matter, the fluid passing in every direction. If the fluid circulating through the dentine comes in contact with the oxy-chloride of zinc, it may dissolve it to a certain extent. We know that oxy-chloride of zinc, in some mouths, will last for a long time, while in others it will gradually disappear in a much shorter one. This, oxy-chloride we know can be dissolved.

How does carbolic acid act?

To determine how this acts, we might try an experiment out of the mouth. How does it act upon the albumen; for instance, the white of an egg? Some would say it acts as a precipitant, forming a salt, by means of which we would have a chemical compound. I have a very strong doubt of any change having taken place in the albumen, except coagulation; and even if there is, I do not think it is a chemical one. We may heat this albumen and have it coagulated, but this is not a chemical change, although the same results have been produced. A chemical change is different; in it there is no shading off, but a sharp, well-defined line divides the part acted upon from that not so acted on. In the action of carbolic acid, there is no sharp line of division; it shades down gradually, until you finally come to a part not acted upon at all. And, again, to disprove that it is a chemical change, you may in time wash all of this carbolic acid out, and not a particle of

it will remain. Just as with the salt, in meat that has been salted; the salt has produced certain effects upon the meat—what effect we do not know—but we can remove every particle of it by repeated washings. If we steep a seed in carbolic acid, it will not germinate; but if we take it out and wash it thoroughly, it will then grow. My theory is, that carbolic acid does not destroy the pulp, but forms over it a surface of coagulated albumen, which shades off into the substance of the pulp and makes the most perfect covering. If instead of carbolic acid you use nitrate of silver, you have chemical action, which gives a sharply-defined line, indicating where the cauterization ceases. Now, with carbolic acid you cover over the surface of a pulp, and have a good covering; over this you place your oxy-chloride of zinc. This covering of creosote allows the circulation to go on, which gradually removes most if not all of it. By the time this takes place, the pulp gets accustomed to the change of having an artificial substance in contact with it, and will tolerate the capping. My idea is, that all these hydro-carbons are antiseptics, and that they all preserve animal tissue and prevent decomposition, and the better they do this the more likely they are to be successful.—*Penn. Trans.*

"READY-MADE SETS."

Parisian newspapers now contain the following advertisement:

"THE DENTIST STOECK.

Rue———, Number———, has the honor to give notice to his numerous customers, that he hires out complete sets or single teeth, for the coming winter festivals, such as Weddings, Balls, Soirees and Suppers."—*Correspondenz Blatt.*

Experience in a Dentist's Chair.—Josephine Haines, a letter-carrier's wife, residing on Haverford avenue, West Philadelphia, had a tooth pulled, as she supposed, while unconscious, by Dr. Harry Leech, a Market street dentist, last December. Several days afterwards she felt an unpleasant sensation in her throat, which gradually extended downward, and became more severe, until she became completely prostrated by terrible pain in her throat. Her trouble baffled the doctors, who could only surmise that some irritating substance was working its way towards the lungs. At length it was evident that there was a serious inflammation of the windpipe, and finally, in a terrific fit of coughing, the sufferer brought up a piece of the root of the extracted tooth nearly three-quarters of an inch in length. From this time forward she grew gradually better, and has now regained her health. Mrs. Haines has sued Dr. Leech to recover damages for alleged negligence and lack of skill.

TWO INTERESTING CASES.

ED. ITEMS:—The following singular anomalies in dentition have recently come to my knowledge, and I therefore report them, as per your desire:

The first is a gentleman nearly forty years of age, who never had a tooth. His arch and alveolar ridges are perfect. He wears complete sets of artificial teeth, with great comfort and satisfaction. He has three children, the oldest has nature's gift of twenty-eight good teeth, the two younger, aged respectively six and nine, so far, have been denied these organs of mastication, and it is expected that they will continue like their father in this respect. The mother's mouth is perfect.

Another case is that of an infant, born with the superior central incisors apparently two-thirds grown, very sharp and hard. The child caused the mother so much pain by biting the nipple, that the physician extracted the teeth. They had no roots. At two years of age no other teeth have come to take the place of the ones extracted.

SEPARATING TEETH.

BY DR. J. G. HARPER, ST. LOUIS.

My mode of separating teeth differs somewhat from that given in the April number of the ITEMS. If the teeth are too close together to pass a ligature between them in ordinary manner, I pass the end of it through between the necks of the teeth to be separated. Then I pack a small pellet of cotton between the teeth on lingual and labial surfaces, bring the ligature over the centre of these pellets and tie firmly. Should there be a cavity on the proximal surface, dry it and varnish, then pack with dry cotton. The cotton will swell from absorption of saliva, and give all the pressure needed; then it is at a stand-still until the cotton is removed. No one manner of separating will suffice in every case, and it is essential to have a number of systems to select from.

Indians' Teeth Decay as well as Ours.—I have examined many Indian skulls from the mounds, and when I begun expected to find some very perfect sets of teeth. The first skull that I came across happened to be that of a young woman about eighteen years of age just getting her wisdom teeth. There was not a good tooth in her mouth excepting the incoming wisdom teeth, and I did not find one perfect set of teeth in all my digging. The opinion that civilization causes decay of the teeth is a fiction. It is not necessarily civilization that causes decay, nor is it probable that it is the kind of food we eat.

DR. G. V. BLACK.

Jacksonville, Illinois.

Scientific.

HUMAN PHYSIOLOGY.

BY L. ASHLEY FAUGHT, D.D.S.

Formerly Lecturer on Physiology in the Philadelphia Dental College.

(CONTINUED FROM PAGE 184.)

The process of deglutition is divided into three periods. The first is occupied by the passage of the bolus backward to the fauces, and is effected by the action of muscles under the control of the will, though generally performed involuntarily. The second is occupied by the passage of food from the isthmus of the fauces, through the pharynx, into the upper part of the œsophagus. This is accomplished by a rapid and convulsive series of movements, which are entirely beyond the control of the will and belong to the kind usually called reflex. The third period is occupied by the passage of food through the œsophagus into the stomach.

During deglutition, the entrance of food into the posterior nares is prevented by the action of the superior constrictors of the pharynx, and by the contraction of the muscles which form the posterior pillars of the soft palate.

Respiration is momentarily arrested during deglutition, and nothing can enter the respiratory passages, so complete is the arrangement for their protection.

The first period of deglutition is under the control of the will, though the movements belonging to it are generally involuntary. Those of the second period are entirely beyond the control of the will, and belong to the kind usually called reflex, as are also those of the third period, which is the most simple of all. The position of the body has little to do with the facility with which deglutition is accomplished, though the act will be performed with difficulty if the mouth be not closed.

STOMACH DIGESTION.

The careful study of stomach digestion is important. Successful medical practice has here, in large measure, its pivotal center. The stomach is an expanded portion of the alimentary canal just below the œsophagus, and the food is received and detained in it, until important changes have been effected. It is included in the upper part of that portion of the trunk known as he abdominal cavity, and is

held in place by the œsophagus and by the serous membrane lining that cavity (peritoneum.) When empty it is flattened and its walls mostly in contact. Its length is about fifteen inches, and its diameter five inches, and holds about five pints. The anatomy of the stomach reveals in its terminology a superior or lesser curvature, and an inferior, or greater curvature; a cardiac or œsophageal, and a pyloric opening. Its coats are three in number:—the peritoneal, muscular, and mucous.

Before entering upon the study of these coats and the human stomach in general, it is desirable that comparative anatomy should be consulted. From such reference it is learned that in those animals in which the food approaches, in its mechanical and chemical condition, the form which it is destined to assume as a part of the body of the animal receiving it, the stomach is simple in construction and is little more than a mere dilation of the alimentary canal; and that when, as in the herbivora, there is a great difference between the form of the food received and the form of the tissues to be made, the digestive sac no longer presents such a simple structure, but is divided into distinct portions, and an increase in the number of these cavites occurs as the food becomes more hetrogeneous.

In the human subject, the peritoneal coat is a continuation of the peritoneum, and like all other serous membranes consists of fibers of white, inelastic tissue, mingled with a considerable number of elastic fibers.

The important function of this membrane is to cover the abdominal parieties and viscera and impart to them a smooth surface which will allow free movement of the organs.

The muscular coat is composed of involuntary, pale unstriped fibers, and exists in two principal layers:—an external logitudinal layer, and an internal circular layer. Toward the pylorus the circular fibers become more numerous, and at the opening into the duodenum, form a muscular ring known as the sphincter muscle of the pylorus.

The mucous coat of the stomach, though a continuation of the mucous membrane lining the œsophagus, differs materially from it in appearance. The white, hard character of the latter is lost in a soft velvety membrane of a reddish-gray color. It is loosely attached to the sub-mucous muscular tissue, and is thrown into large longitudinal folds, which disappear when the stomach is distended.

The surface of the membrane is marked by polygonal depressions, irregularly distinct. Opening in the bottom of the depressions are immense numbers of racemose glands. That these glands differ greatly in their minute anatomy in different parts of the stomach, is worthy of notice, as some physiologists base upon the fact a theory of difference in- of function in the various portions of the mucous membrane. There are, deed, two distinct varieties of glands—the gastric and the mucous.

The gastric or peptic glands are found everywhere in the mucous membrane of the stomach, except near the pyloric orifice, and in the lesser pouch. They are supposed to be active only during digestion, and to secrete the gastric juice, as they have in addition to the columnar epithelium of the mucous glands, rounded cells of glandular epithelium.

Near the pyloric extremity, and in the lesser pouch, are mucous glands lined by the columnar, but deprived of the glandular epithelium of the true peptic glands. Closed follicles occur in limited number in the stomachs of children, but are inconstant in adults.

The study of the gastric juice properly dates from the famous experiments of Dr. Beaumont on Alexis St. Martin, which were begun in 1825. This individual was in the service of the American Fur company—eighteen years of age—and was accidentally wounded in the left side by the discharge of a gun. The wound included a perforation of the stomach. Upon healing, a communicating opening was left from the outside of the body into that organ, which was closed by a protrusion of the mucous membrane of the stomach in the form of a valve.

From experiments performed during the lifetime of this individual, and since confirmed by similar experiments in other directions, are gathered many of the important facts known with reference to the digestive fluid.

The gastric juice is produced only normally in obedience to the stimulus of food. During the intervals of digestion the mucous membrane is comparatively pale, but on the introduction of food it becomes red and turgid and gastric juice is secreted in quantity. In feverish conditions, moments of fear and of anguish, etc., the flow of gastric juice becomes checked, and want of appetite and general uneasiness is often felt in the region of the stomach. At such times it is folly to attempt to sustain strength by forcing a patient to eat when food cannot be digested. About fourteen pounds of this fluid is secreted in twenty-four hours, but it must be remembered that the enormous quantity is reabsorbed by the economy, and that only a small proportion of it really exists in the stomach at one time. Its specific gravity ranges from 1005. to 1009. It is inodorous and resists putrefaction. No minute analysis of it is on record. Its organic principle is pepsine or gasterase. The reaction of gastric juice is always acid and, although a much discussed point, the source of this condition is now generally admitted to be free lactic and not hydrochloric acid. The stimulus of food also excites the peristaltic movement of the stomach, which is produced by the alternate contraction and relaxation of the longitudinal and circular fibers. This action produces a churning motion of the food, incorporating it thoroughly with the

gastric juice. Thus it is that alimentary articles are digested by the disintegration, softening and liquefaction of their albuminous ingredients.

The saline constituents of the gastric juice are of little importance in comparison with the organic matter and acid principles; for its digestive power depends upon these; and, although a special acid has been mentioned, it is shown by experimentation that it is not so much this particular acid, as it is a certain relative degree of acidity, which may be sustained by other acids.

Various tests have proven that the digestion of meat in the stomach is far from being complete. The connective tissue and sarcolemma is dissolved out, but the true muscular tissue is only partially broken up, the digestion of it being completed in the intestines; thus the action of the stomach on this substance is preparatory, and not final. Albumen, fibrine, caseine, and gelatine are digested by the gastric juice, so also are vegetable nitrogenized principles. The qualities of the gastric juice are directly adapted to the natural food of man, but may be much modified by a very gradual change in diet, and become fitted to digest elements of an opposite character. This same modification may take place, too, in certain states of health. In view of this fact, it is significant that sudden and great changes of diet are liable to prove positively hurtful.

(TO BE CONTINUED.)

RUBBER PLATES AND METAL LNINGS.

After six months experience with Dr. J. A. Robinson's metallic lining I have no hesitation in giving it my unqualified approval. It adheres perfectly to the rubber plate, keeps the mouth cool as a gold or continuous gum plate, and will cure the worst sore mouth in from four to six weeks. It brings the price of rubber plates to a satisfactory point to the dentist, and not burdensome to the patient.

After an experience of forty-two years in dentistry, I must give rubber plates lined with Dr. Robinson's metal the preference (all things considered), over all other material for bases for artificial dentures.

Then again, this metal is the best material in combination with gold that has ever been invented as a filling for teeth. It is better for the form of the tooth than gold, and in combination with gold, for crown and bicuspid fillings, will prove a great success, where gold alone will prove a failure. Deep, coarse, serated pluggers and a little experience with the combination, and the result will rejoice the heart of the experienced dentist.

E. F. WILSON, D.D.S.,

185 Powers Building, Rochester, N. Y.

MOTION AND SOUND.

BY DR. J. F. SANBORN, TABOR, IOWA.

Light, in its motion, passes in waves 500,000 to the inch, crossing back and forth across the axis of its course. When it strikes an obstruction it may be absorbed, arrested, reflected, or refracted, according to the nature of the obstruction. These waves are a motion in a celestial ether, that is supposed to pervade all space, however remote.

Sound is also transmitted by waves, but in a very different manner, and by the atoms that constitute the air. These atoms are held in their relative positions to each other by mutual repulsion—that is, they do not touch each other, but each holds the other at arm's length, so to speak, and when an impulse is made, that produces a sound—the first atom of air is forced toward the second, causing a condensation—that is, the atoms do not touch each other, but are nearer than their repulsive natures allow them to remain; so No. 1 is forced back to its original position, but instead of stopping there it passes beyond, thus leaving a rarefied condition of the atoms. Thus the wave is propagated from atom to atom; first condensed and then rarefied; thus sound passes along by the oscillating motion of the atmospheric atoms.

There is a marked distinction between the motion that constitutes light, and that which constitutes sound. They are not interchangeable. They require two distinct senses to take cognizance of them.

In the motion that constitutes electricity there is still a marked difference.

For illustration, suppose a series of ivory balls to be suspended in a row so as to just touch each other.

Now, if the first ball is withdrawn from the second a few inches, and then allowed to return suddenly and strike ball No. 2 with considerable force, the ball No. 2 does not move from its place, but transmits the blow to No. 3, and this to the next, and so on to the last ball in the row, which, having no one to transmit it to, is thrown from its fellow a distance proportionate to the force with which No. 1 struck No. 2.

In the working of the electric telegraph, the atoms of the iron wire that transmit the electricity do not move, but the first atom receives the force and it is transmitted from it to the next, and so on to the last one, where there being a break in the connection, the force is manifested. This is the present explanation of galvanic motion, as we understand it.

Warmth retained by Acetate of Soda is much superior to that of water. For warming-pans for the feet on a journey, or for bottles to pack near the body to increase its temperature in bed, a much greater quantity of heat may be stored in acetate of soda than in water, and it continues to gradually give it out four times longer.

Miscellaneous Editorial.

THE LIFE OF THE TREE.

We may well speak enthusiastically of animal life and functions; but if we are observant, we shall also see wonders in the growth of vegetables. The tree lives, breathes, eats, drinks, digests, and assimilates, and in many ways rivals the animal in its activities and inherent transforming powers. While we have but one mouth, the tree has thousands—as many as it has rootlets. At the extremity of each of these a little mouth opens and mysteriously selects, dissolves, and appropriates the ingredients required for the food of the hungry tree. Let us look a little into this process of tree circulation, digestion, and growth.

It is generally understood that the respiration of the tree is the absorption, through its leaves, of carbonic acid gas, and the giving off of oxygen. But where does this oxygen come from? Instead of the tree giving it off, it is only that contained in this acid which the tree rejects. The chlorophyl, or coloring matter, of the leaf, separates the one part of carbon of this gas and passes it on to the circulation, giving back to the atmosphere its two parts of oxygen. But even this peculiar power of the leaf cannot thus appropriate carbon without the assistance of the sunlight; so that this process goes on only during daylight—no artificial light is sufficient. This action is generally called respiration, but it is rather digestion. It imparts an assimilating property to the sap without which the mineral salts brought in from the earth could not be converted into starch.

Distinct from this action, the tree breathes, not so very differently from ourselves. It takes in oxygen and gives off carbonic acid gas, though not to the same extent as with animals. This takes place everywhere beneath the surface of the bark and leaf, more actively in the leaves and beneath the new bark of the tender branches. In fact, leaves are but the broad expansions of newly made bark. This process of breathing is through the network of air cells which constitutes the tree's cellular structure, somewhat corresponding to the air vessicles of our lungs. Between these cells are spaces or tubes for the circulation of sap and for the admission of air and moisture. The salts from the earth, raised to every part of the tree, are gradually changed by the carbon brought from the leaves, and the oxygen from the air cells into the tree's structure.

We must keep in mind, therefore, the difference between the process of digestion in the air cells of the leaves, as the carbonic acid gas comes in contact with their green pigment, and respiration, which is

the inhalation and exhalation of air and moisture through the cellular structure. And both these must be considered distinct from the tree's circulation. This takes place through those pores found between the air cells of this cellular structure, the epidermic membrane or inner bark of the new wood and leaves. The circulation of the sap almost ceases during the winter. The respiration is constant, though less during winter, when the whole tree is in a species of sleep. It is only during the day that the little air tubes beneath the bark and leaves are open for the imbibition of moisture and air. During the night, while these tubes are closed, is the principal time for digestion and growth. Most plants grow but little during the day.

The action of the carbon on the sap is to form starch. This is not a food of itself, for in its conversion into material for the purposes of growth, it is changed into sugar by oxygen. Much of this starch is stored in the cellular structure during the fall and winter, to be rapidly changed into sugar during the fresh life of the tree in the early spring. In some trees, as the hard maple, the sap is so sweet that it is collected and boiled down into sugar.

OUR GENIUS.

It was anciently thought some men had a special superintending spirit to guard them through difficult places, to instruct them in intricate problems, and to assist them in doing things which would otherwise be impossible. Others were obliged to plod on, dependent on nothing but their own industry.

Though this may have been an error, we all have our genius; and though this may not be a supernatural being, it is an intelligence within us of wondrous power. That man is blessed who recognizes his presence. Genius may be asleep, but we have only to arouse him to make him work wonders for us.

Many men go through life without showing more than what their mere muscles and the most ordinary use of their faculties can do. The genius behind these waits to be awakened. Doubly blessed is that man who is so forced into straits, so overwhelmed by disaster, so brought face to face with impossibilities that must be overcome, that he must receive help from above and beyond what (every thing that) is ordinary. Then it is that his very struggles arouse the genius within to inspire with hidden resources, and strengthen with enthusiasm. He soon bursts constraints, makes merchandise of disasters and laughs at impossibilities. Such a man soon rises from the level of the ordinary multitude and becomes a mystery to himself and a marvel to the world.

It is thus that genius shows what we are made for, and when faithfully followed, what we can do. He is sure to give us the key to the treasury of success.

We may look for him in vain. He is too wily to be seen by obser-

vation and too shrewd to be caught by pursuit. We may feel after him diligently, and for a long time, but he eludes us. We shall not find him till we cease looking for him and depend for success on industry, thoughtfulness, and perseverance. As he sees us in earnest for success he comes to us unbidden and helps us unseen. When we become so absorbed in doing for ourselves that we forget there is such a thing as genius and ignore everything but hard work and hard thinking, then it is that genius, unnoticed, peaks round the corner of our workshop to see what he may do for us. He throws a chip here and there to attract attention to advantages; and coming behind us, guides our fingers so deftly and our thoughts so cunningly that we are carried through intricacies and taught wisdom till we triumph in our undertaking. We are thus brought into a large place which we come to recognize as *our* place. But if we would keep that place and grow in it—if we would have our *place* become our *home*, it must not be irksome to us—a mere means for a livelihood—we must cherish it, and continue to improve it by the same means we attained it—industry, thoughtfulness, and peresverance.

THE TIME FOR STUDY.

There seems to be no rule for determining the best time for studying. Some find the night the most propitious, and only get well at work when all about them are asleep. Others want the bright day. They make their study their daily work, and subject it to the same rigor of time and discipline as mechanical employment. Others, again, are more the subject of their spirits and the harmony of their surroundings, never thinking of hard, close study unless they feel like it, and then work regardless of sleep, hunger or tire till they are through with their special thought or topic. There are those who have the notion that bright conceptions come more readily under moderate stimulants, at least, that of tobacco; while others give us their best thoughts when their minds and passions are entirely normal. Some are able to think more strongly and clearly after a generous meal, and others upon an empty stomach. Some wait for inspiration, and when a bright idea strikes them, leave everything at any time to record it just as it flashes upon them; while others obtain what they know by the hardest—plodding along in a regular way in their studies as in everything else; they do not look for worthy results from any other source than from hard work. Some find the evening their time for study, if they are physically employed during the day; others feel drowsy and mentally dull till after sleep, and therefore prefer the morning.

For twenty years we have done most of our writing and reading in bed—as injurious to the eyes as this is supposed to be—only about an hour in the evening, but from 5 to 7½ o'clock A. M. in the winter, and

from 4 to 7 o'clock A. M. in the summer. By this means, we do not seem to rob ourselves of physical rest, and we rise as well prepared for a hard day's work as though we had added most of this time to our sleep.

We can not judge for one another what is the best course. Our occupation, habits, surroundings, necessities, moods, preparation, physical and mental conditions differ so much, we are obliged, to a great extent, to be "a law unto ourselves." Each must adopt that which seems best adapted to himself and his surroundings, *except* that all who would have permanent success, must avoid artificial stimulants, unwarrantable drafts upon the physical energies, and such over-strain of the intellectual faculties as to produce mental weakness. But we must have some plan—careful experiment and experience will show what is best. Then stick to it till it becomes a habit. Habit assists wonderfully in adapting us to our work, in making that work easy and pleasant, and in assuring continuity and success.

We once knew a young man who was obliged to work fifteen hours a day at cabinet work, and yet he found time for study, because he *would*. Every day he had a leaf of what he wished to study pinned up before him, to commit to memory during the day. It is not necessary to say that young man became an intellectual force.

When a boy at school, an Episcopal clergyman came in one day to talk to us. He gave us excellent advice. After leaving, our teacher said: "Children, only a few years ago that man was a poor, friendless wood-chopper. But he always took his book into the woods with him, studying on the road and during every moment of the day possible. When he felled a tree, he placed his book open on the stump, and while chopping the tree into cordwood, ran for a few sentences to memorize and digest. He is a great and good man now." Elihu Burritt, "the learned blacksmith," obtained most of his education and intellectual maturity and strength while at the anvil.

Old age is a difficult time for study, and yet we have all known those who have spent fifty years in thoughtlessness and dissipation, turn about so radically in their habits and character as to become learned and useful.

Sickness is a hard time for study, but there are those who accomplish wonders in spite of physical weakness and pain. One of our most popular dental journals is edited by a man who has scarcely known a well day for many years, or been free from physical suffering. The chief editor of the *Popular Science Monthly* has been an invalid for much of the last twenty-five years, and blind at that.

Many have been brought to their senses by suffering or calamity, and awakening to what they might have been, have "redeemed the time," under circumstances of the most trying difficulties. A middle-

aged man in State's prison for seven years, was very ignorant and a curse to the world till he was incarcerated, but when he came out, he was a scholar, and went through the world a light of no mean order.

The time for study, therefore, is any time we can find. Those who have daily occupations, can not generally have their choice, and unless they are very diligent in searching for it, will find no time at all. But with a real will to find it, it is astonishing to see how much can be found, and how much accomplished by it.

Few occupations favor study more than dentistry. The day's work is short and of regular hours, and frequently considerable time intervenes between patients. There are only a few who become so fatigued that it can not be thrown off with a brisk walk, or a good laugh and romp with the children. If still you are tired, a study which interests will give rest. Then you have the whole evening and the long morning for study.

But even if your professional work is over-taxing, and you come home "too tired to eat," do not forsake your regular course of study.

As we have said somewhere before, rest is not always inaction, but a change of activities. Anything that is an entire change from the business of the day is often a rest. We have probably averaged fourteen hours a day hard work for forty years, but have made it easy and pleasant by variety, especially of division of labor between mind and body.

Remember, "where there is a will there is a way." Make up your mind thoroughly that *there shall be a time for study*, and there will be.

SOME THINGS CURIOUS ABOUT MATTER.

ARTICLE I.

ATOMS OF MATTER.

Matter is anything which occupies space. So far as we have knowledge, all matter is divisible. The smallest particle we can see is a molecule. This is composed of still smaller particles, called atoms. An atom is the smallest division of an ultimate principle. What we now call an atom, because we believe it to be an ultimate division of a simple substance, may prove to be a cluster of atoms, and, perhaps, atoms of diverse characters. Molecules and atoms are, therefore, only relative terms; for it is impossible to know dogmatically what are ultimate divisions and what are simple principles. The minutest particle of water was once supposed to be an atom of a simple substance. It is now seen to be a molecule, composed of three atoms—one of oxygen and two of hydrogen. Then, again, with this discovery it was affirmed that these three atoms were chemically united. They now prove to exist together only mechanically. The minute particles we see floating away as a white cloud from a steam engine, we used to

suppose to be steam; we *call* it steam yet, but know it is not. Steam is composed of globes of gas of such transparency as to be invisible. As these break up into minute particles of water, they are visible, and as one and another unite and form heavier bodies of water they fall as mist.

It is difficult to conceive of the minuteness of an atom. With the point of a fine cambric needle pick up a very small portion of a drop of water from a stagnant pool. The amount you obtain is not the fiftieth part of a drop; yet, in this, legions of animalcules swim, and dive, and fight, and pursue each other as in an ocean. How small they must be! Of course they are too small to dissect, and yet they are composed of distinct organs, and have a circulation, for they eat and digest food, and propagate their species. How much smaller than they, must be their various organs—their stomach, for instance; still smaller the atoms of food taken into it; and still smaller than these the particles of digested food prepared for assimilation! And what shall we say of the globules of the blood that circulate through the blood-vessels, and of the infinite minuteness of the fibers of the muscles employed to give these little creatures the power of the vast variety and quickness of motion they manifest? But these animalcules are not atoms of matter, nor even molecules. Each animalcule, as we have seen, is composed of many organs, and each organ of muscles and membranes, and each of these of fibers and vessels. Then, again, each of these are compounded organizations; that is, they are made up of various elements of animal composition. Where shall we stop? We have not yet reached the atom of a simple element!

THE POROSITY OF MATTER.

We say no two things can occupy the same space at the same time; yet we see some things that appear, at first sight, to contradict this. Here is a solid piece of wood which occupies exactly one cubic foot, yet we can put into it a cube of iron, more than one-quarter its size, without increasing the size of the wood, by simply cutting up the iron into small spikes or nails and driving them in, one by one. The explanation is, that the wood is composed of a network of fibers, constituting cells filled with air. The pieces of iron press closer together these fibers, obliterating the cellular spaces, and occupy the room thus made.

A tumbler filled with water may have a hundred pins carefully thrown in singly without any water being spilled. The explanation is that the surface of the water becomes piled up above the rim of the tumbler and thus occupies as much more space as the bulk of the pins.

But try salt instead of pins. Now it will be seen, if the salt is allowed to dissolve as it is put in, that a large quantity may be added

without increasing the bulk of the water. After the water has taken up all the salt it will, other substances that will dissolve may be added without increasing the bulk of the water. The explanation is that the molecules of salt being finer than the molecules of water, occupy the spaces between them. Then, of course, the substance added after the salt must have molecules finer than those of the salt. It is like the merchant who made more apples by assorting them. By measuring the different sizes apart he made a half bushel from each barrel. You may get almost two barrels full of different commodities in one, in the following way: First select large apples, and having put a few in the barrel, fill up the interstices with beans; then shake in a quantity of timothy seed, and, if you chose, follow this with seed still smaller. Thus proceed till the barrel is full. You will be able to transport twenty barrels of your products in ten barrels of space.

Nothing seems to be solid. As we have seen, wood is merely a honeycomb; water is composed of little molecules of hydrogen and oxygen, with air spaces between each. The most solid rock is porous, so is the densest metal.

But the pores or spaces in matter we have been speaking of are visible or sensible pores; besides these there are what are termed *physical* pores which are quite invisible. The fact is undoubted now by learned scientists, that while atoms are so small they cannot be seen, they are also so separated by space as not to touch each other. As Prof. Steele says: "The spaces are so small they cannot be discerned by the most powerful microscope, yet it is thought they are very large compared with the size of the atoms themselves. If we imagine a being small enough to live on one of the atoms near the center of a stone, as we live on the earth, then we are to suppose that he would see the nearest atoms at great distances from him, as we see the moon and the stars, and might perchance have need of a fairy telescope to examine them as we investigate the heavenly bodies."

ANIMAL INSTINCT.

The instinct of animals is shown in many ways. Their almost unerring selection of proper food is a wonderful example. If left free to choose, they seldom, even by accident, take what is injurious. This is especially so in their roaming state. In confinement, their taste becomes somewhat perverted by privation of power of choice, but even here they show great sagacity. This instinct is not confined to health. In sickness, they will not only refuse some things which in health they are fond of, but choose what in health they would discard, thus appearing to know what is best for their various conditions. The cat's liking for catnip is proverbial. In health, and when it has free access to it, it only minces at it occasionally, but in sickness, and when long de-

prived of it, its fondness for it is wonderful. If you have never tried the experiment, and your cat has not seen this herb for some time, buy a little, the green is preferred, but the dry from the druggists will do, and see how pussy will show her fondness for it.

Each species of animals has instincts peculiar to itself, and each marvelous in their exhibition. We can not go into details, but if you have not given the subject special thought, turn your attention to it for a time, and you will be abundantly repaid for your labor.

Man also has his instinct, but by confinement within special spheres of living and acting, and by the force of civilization and education, it is so blunted and warped we can not depend on it. Yet, even now, instead of eating anything set before us, if we will be guided somewhat by our *instinctive* choice, we shall often show wisdom. Even in sickness, what we prefer will often indicate what is best, and sometimes, what will prove to be a medicine just adapted to our needs.

Water in motion is a great disinfectant and purifier. While stagnant water is often a disease-breeder, running water, or that which is agitated, as in the case of the waves of the sea, or even as in the great tanks on board vessels at sea, becomes wonderfully cleansed. It is done by constantly presenting these impurities to the action of the oxygen of the air, causing them to be reduced to their original elements, their residuum being precipitated. Water filtrating through the ground becomes finally cleansed, however charged with impurities.

So, as a disinfectant, the air, ever so highly charged with miasmatic germs and contagious spores of disease, becomes purified by copious showers. Every drop of rain, as it passes through the air, takes these, and, passing into the soil, leaves them there as fertilizers, itself passing on, purified, to our wells and springs. There are few articles so affected with poison that they cannot be cleansed by being put into running water, or subjected to its filtration.

The value of ammonia is seen in the fact that stable-keepers are among the healthiest of men, and considered especially free from respiratory affections, although much exposed to cold and damp. This is probably to be attributed to the ammonia evolved from the manure piles, and it is said in corroboration that little breast amulets of carbonate of ammonia, or spraying of the throat with diluted liquid ammonia, gives sure relief in bronchial attacks.

Paraphiline, a residuum in the manufacture of coal gas, is one of the most remarkable disinfectants yet discovered. Many thousand little cones of this are used by the United States government to protect entomological preparations from destruction by insects. It is also proof against moths, and their propagation from eggs in clothing and furs.

Miscellaneous.

BATHING.

Hot baths, by which are meant those of a temperature of from 85° to 105° Fahrenheit, are chiefly used in the treatment of diseases, as powerful stimulants, and scarcely require notice here. Every parent should remember, however, that a hot bath, causing free perspiration, promoted by wrapping up warm in bed with blankets, will often save children and adults severe attacks of illness, if promptly resorted to after exposure to cold or wet, and is a good means for overcoming fevers and inflammations.

Cold baths are invaluable aids in promoting and preserving health, if properly used in suitable cases, but may become dangerous agents, causing even fatal results, if employed by the wrong individuals, at improper times, or with excessive frequency. Very cold plunge-baths, that is those below 50° in temperature, should only be indulged in by the most robust, and even with them it is doubtful whether the shock to the system is not more injurious than the after reaction is beneficial. In every instance, the test for the advantage of a cold bath is very simple and easily understood, being merely the occurrence or non-occurrence of this reaction or "glow" as soon as the skin is dried; when such a glow is felt promptly, the bath does good, and may be repeated at the same or a slightly lower temperature; but if reaction takes place slowly, or not at all, the person feeling chilly, and the lips, the skin beneath the nails, and, indeed, that of the external surface generally, continuing for ten or twenty minutes bluish instead of pink, the bath does harm.

Cool (not ice-cold) sponge baths are valuable tonics, and may often be advantageously used in delicate states of health. The shock to the system is much less than with the plunge-bath, and the consequent reaction less intense, but the rule for judging of their beneficial influence is precisely the same.

Sea-bathing is one of our best means of strengthening the system, either to prevent the development of actual disease, or to restore the original vigor to a constitution recovering with difficulty from the effects of some debilitating malady. No doubt much of the supposed advantage of sea-bathing is often due to the sea-air, and the other influences —mental, physical and social—which belong to the various watering-places upon the coast; but this combination of favorable conditions is so invaluable, especially with children, that I have often seen a single day's excursion to the sea-side produce a marked and obvious improve-

ment in those whose general health had for any reason fallen below their normal standard of vigor. Unfortunately, many of the sea-side resorts are supplied with impure water, often contaminated with sewage from the cess-pools, which send their disgusting contents soaking through the loose sandy soil for hundreds of feet, poisoning the drinking-water of wells and cisterns, and spreading the germs of diarrhœa, typhoid fever, diphtheria, etc., to such an extent that, if they are not guarded against, even the benefits of sea-air and sea-bathing are more than counterbalanced. For the many delicate ladies and children who are not strong enough to endure the shock of cold sea-baths in the surf, bathing in warm salt water, as now supplied at the chief sea-side watering-places, is invaluable.

Baths should never be taken immediately after a meal, nor when the body is very much exhausted by fatigue or excitement of any kind.

Children and elderly persons ought to employ warm or but slightly cool baths, never below 70° Fahrenheit. In persons of nervous temperament, and the subjects of valvular disease of the heart, cold baths should be very cautiously resorted to, but in robust adults of sanguine or bilious temperament, they may be indulged in with much greater freedom.

J. G. RICHARDSON, M.D.

PAPIER-MACHE.

Papier-mache, as every one who has a smattering of French is aware, means simply *chewed paper*, which at first thought would seem to be of little practical value, except in the fabrication of the missiles known to mischievous school boys as "spit-balls." But we have repeatedly had to chronicle the increasing use of paper in the arts. It may almost claim to rival iron in the multiplicity of its industrial applications. In Europe it is employed to a considerable extent in architecture, from a complete church building in Bavaria (capable of seating a thousand persons), having columns, walls, altars, roof, and spire of papier-mache, to the finest traceries of a Gothic screen. Some of the most tasteful halls in Britain and on the Continent are finished in it, in preference to wood. The mantels, and the mirror frames they support, are of its composition; and, strange as it may seem, the very chandeliers, in their gilded elegance, are of this humble material. Its use in architecture can literally have no limit; for no one to-day can say what may not be made of it. In toys, tables, and *bijouterie* of all kinds, we have examples of its extensive uses, and suggestions of future applications. Papier-mache never cracks, as wood, plaster, terra-cotta, etc., will do. In the same articles it can be made, if required, far lighter than plaster, terra-cotta, metal, or even wood. Neither heat

nor cold affects it; it can be sawed, fitted, nailed, or screwed, quickly adjusted or removed, gilded, painted, marbleized, or bronzed. It can be made light as cork, or heavy as stone; never discolors by rust, as will iron; is not affected by temperature or oxygen, as is even zinc. It can be made, for a given thickness, stronger than any white or rare marbles, and is even tougher than slate, quite as hard, and will not chip corners nor crack off in strata.

One of the great advantages of papier-mache is that it can be produced very cheaply. In architecture it can be supplied nearly at plaster prices, and, taking into consideration the price of putting up, costs no more, and sometimes even less. This depends on the size of the ornament, the larger being cheaper in proportion. It can be made to imitate the rarest marbles, as it takes a polish superior even to slate, and costs not half as much as the preparation of plaster of Paris, known as scagliola, while it is infinitely stronger. Pedestals, columns, newel-posts, vases, clocks, and multifarious other articles are made of it in elegant and durable forms. Possibly, as a recent writer remarks, "when the forests of the globe are regarded as curiosities, and the remaining groves are preserved with the same care that has guarded historic trees, the cast-off rags of mankind, and the otherwise useless weeds, reeds, and grasses of the marsh or swamp, will take the place of timber in construction, and many will welcome the change, if for nothing else than that it will obviate much of the nuisance of frequent repainting."—*Boston Journal of Chemistry.*

MICA.—Next to asbestos, mica is the most remarkable of mineral substances. The peculiar physical nature of both is the result of a crystalline tendency, which for the asbestos manifests itself in fibrous filaments, while in mica it causes the formation of thin plates or layers —so thin, indeed, as to be often equal to that of the envelope of a soap-bubble, as proved by comparison of the play of color in both, a phenomenon by which the length and velocity of the luminous waves of different colors have been determined.

Annealing Lamp Chimneys, Chinaware, etc., may be done effectually, according to a Leipsic journal, by placing them in cold salt water and allowing the water slowly to come to a boil, and after an hour's boiling letting the water as slowly to become cold again.

Sure Cure for Corns.—A. C., who has tried it, is authority for the following: Take one-fourth cup of strong vinegar, crumb finely into it some bread. Let it stand half an hour, or until it softens into a good poultice. Then apply, on retiring at night. In the morning the soreness will be gone, and the corn can be picked out. If the corn is a very obstinate one, it may require two or more applications to effect a cure.

MISTAKES EMINENT MEN MADE.

Washington, it is said, once decided that the Erie Canal was not practicable. Sam Houston thought one-half the money Congress voted to Morse to build the first telegraph line ought to be devoted to encourage mesmerism. Cave Johnson, Postmaster-General, declined to buy the telegraph patents for the government for $100,000 on the ground that it could not earn expenses. Ezra Cornell spent two-thirds of Morse's appropriations laying the first poor starveling telegraph underground instead of stretching it like a clothes-line. The old Baltimore merchant to whom Poe's poems were submitted indorsed them: "Here is a man fit for nothing whatever." Commodore Vanderbilt told his son to buy no railroads outside of New York State. Old age, is for counsel, but it ought to come from the "Amen" benches.

D. M. T. writes: I have some trouble with nickel plated cast iron rusting through being exposed to a moist atmosphere. The work is carefully washed both before and after being plated, and has a heavy coat of the protecting metal, but still it rusts. I am told that in the east an undercoat of bronze or some similar material is used before plating, which prevents the rusting. Can you give me the process? A. Give the metal a thin coat of copper by electricity before nickel plating.—*Scientific American.*

Baking Powder.—1. One part bi-carbonate soda, two parts of pure cream tartar, sift together and bottle or keep in a paper sack or closely corked bottle. We know this to be good for biscuit, cake or pastry.

A Really Indelible Ink.—The ordinary so-called "indelible" inks are prepared with salts of silver, and the writing done with them may be removed by soaking the linen with a solution of cyanide of potassium (exceedingly poisonous, it should be remembered), or of hyposulphate of soda, or by moistening with a solution of bichloride of copper, and then washing with aqua ammonia. A really indelible ink, that is, one that cannot be removed by chemical agents, may be made from analine dies, according to the following recipe:

Take of analine black, 1 dram; hydrochloric acid, 60 drops; alcohol, 1½ drams. To be well rubbed in a mortar, after which, add a hot solution of 1½ drams of gum arabic in 6 ounces of water.—*Missouri Dental Journal.*

LAWRENCE, Mass., April 4th, 1883.

T. B. WELCH & SON, *Dear Sirs*:—In your last issue of ITEMS OF INTEREST you ask: "What is the best thing to facilitate the hardening of Plaster of Paris?" Let me answer, (after an experience of 33 years), Potassa Sulphate, one fluid ounce to one quart of water.

Yours respectfully, JOSEPH AUSTIN, Dentist.

PHONETICS.

The following twenty characters are proposed mostly as additions to the ordinary letters, so as to make a phonetic alphabet of forty-three letters:

H ɥ A a ʌ ʌ Ǝ ə I i E e ɤ ɣ Ɔ ɔ O o U u ʁ ɹ R r
*a*rm *a*nd *a*ir *e*el *i*ll *e*ll *a*ll *o*ld *o*n *u*p *r*e *e*r

ʃ ʃ ʍ ɯ ∀ ɐ ɪ ɪ Q ɋ X x ʍ ʍ C c ⊥ ɬ ⊥ I ɬ ʞ ʞ ⅁ ɟ ⅁ ɠ.
t*o* t*oo* *a*le *i*le *oi*l *ow*l *u*se *ch*u *th*e *th*in *sh*e *vi*sion si*ng*.

Nx fʌr a fʍ minits, supɔz ʍ ɹɪɔ ɐwɐ ʍr pɹejʍdis and giv us ɟə atenɟun ov ʍr ɹəzn. Nevr mɪnd hwʌt iz popʍlr, konsidr hwʌt iz best. Nevr mɪnd hwʌt uɟrz wɔnt duɯ, tel us hwʌt ʍ wil duɯ, if ʍ ɥr satisfɪd fɔnetik cʌraktrx ɣt tʃ pɹævɐl.

Tɐk, fʌr instans, ɟat "ɣt;" Hwɪ ʞʃd it bə speld wiɟ fɪv letrz hwen tɯ wil ffli ekspɹes its sxnd? Hwɪ fɪv in lɪt, laf, dɔ, ʌt, ɹuf, fɪt, pic, and ɐt? Tɐk "letrz:" hwɪ ʍz s fʌr its fɪnl sxnd hwen it iz z? Sɔ wiɟ iz, haz, hiz, pləz, duz and trəz? And hwɪ pʃt ɟe sekund e in "letrz" hwen its sxnd iz absent? So in mɪzr, fʍr, txr, sevn, levn, hevn, ofn, fasn, əvn, sivl, sɐvd, blɐmd, luvd? And ɟɔz tɯ tz? ⊥r iz ɔnli wun sxnd ov t. Sɔ in mɔst ov ɟəz dubl letrz, az matr, felɔ, foli, sili, bubl, madr, selr, boni, wʌrd, mand, pend, sind. ⊥en ɟat "why:" kan ʍ giv a ɹəzn fʌr pʃtiß ɟe w befɔr ɟe h, hwen ɟe sxnd iz aftr it? Sɔ wiɟ hwɪl, hwic, hwʌt, hwəl and hwɔ.

Kompʌɹ ɟe folɔiß speliß and tel us hwic ʍ ɪiß pɹefrabl:

Height—hɪt; neigh—nɐ; keighton—kətn; heifer—hefr; heinous—hənus; naught and nought—nʌt; draught—dɹaft; drought—dɹxt; wrought—ɹʌt; borough—brɔ; though—ɟɔ; through—ɟɹɯ; rougue—ɹɯʃ; rogue—ɹɔg; catalogue—katalog; fatigued—fɐtəgd; unique—ʍnək; bureau—bʍɹɔ; douche—dɯʃ; boulevard—bɯlvɥr; bouquet—bɯkɐ; zephyr—zefr; xenia—zenia; sew—sɔ; choir—kwɪr; ocean—ɔɟen; conscience—konkens; bonbon—boßboß; depot—dəpɔ and dɐpɔ; yacht—yʌt; one—wun: women—wimen; you—ʍ; eye—ɪ; heirs—ʌrz; crochet—kɹɔɟɐ; croquet—kɹɔkɪ and kɹɔkɐ; wrong—rʌß; llama—lʌma; pneumatics—nʍmatiks; mnemonics—nəmoniks; rheumatics—ɹɯmatiks; rhyme—ɹɪm; hemorrhage—hemɔrəj; hymn—him; knurl—nurl; plumb—plum; kiln—kil; half—haf; sign—sɪn; walk—wʌk; almond—amond; comptroller—kontɹolr; tzar—zɥr; business—biznes; attempt—atemt: they—ɟɐ; asthma—azma; physic—fizik; phthisis—tesis, tɪsis, ɟəsis, ɪɪsis; colonel—krnl; caoutchouc—kɯcɯ.

Wə ɥr told wrdz ov difrent məniß but ov similr sxndz ɥr spelt difrentli tʃ distißgwiɟ ɟʌr məniß. ⊥is "hapnz" in sum kɐses but in meni uɟrz not. Fʌr instans: "Read what I read to you in Reading and it will lead you to a lead of lead in a mine of mine which I mine."

"While the bow in the heavens encircle them, all the archers bow as they pass to the bow of the boat and bow their bows to shoot through the bow at the top of the boom."

In fakt, ɟr iz nɔ ɹɯlz fʌr speliß in ɟe old wa; ɟr iz nɔ ɹəzn, nɔ komun sens in it. It iz utrli nonsens fɹʌm bəginiß tʃ end.

Hx muc mɔr konsistentli and defintli wrdz ɥr spelt fonetikali.